SIEMENS

ARCADIS

SP

Quality Assurance

System

Image Quality Quick Test

Valid for:
VARIC/ORBIC
SW Version VB13

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Table of Contents 3

1 Introduction 6

Notes and symbols . . . 6
General safety information (in existing documents) . . . 8
System identification . . . 9
Required measuring equipment and tools . . . 10
Requirements . . . 11
- Basic measuring conditions . . . 11
- Activating, deactivating, and selecting the exam sets relevant for the IQ test . . . 11
- Loading the ASPIA test images relevant for the IQ test . . . 13

Orbic tableside control (overview) . . . 14
Varic tableside control (overview) . . . 17

2 Monitors 19

Available monitors . . . 19
- Color monitors ❒ available . . . 19
- Monochrome monitors ❒ available . . . 19

Monitor brightness . . . 20
- Color monitors . . . 20
- Monochrome monitors . . . 20

Monitor contrast . . . 21
- Color monitors . . . 21
- Monochrome monitors . . . 22
- Visual evaluation of the SMPTE calibration test image . . . 22

3 Checking the ADR control characteristics 24

Requirements . . . 24
- Evaluation . . . 24

ADR control characteristics for the fluoroscopy mode . . . 25
ADR control characteristics for pulsed fluoroscopy mode . . . 26
ADR control characteristics for DR mode . . . 27

4 Checking the image position 28

Prerequisite . . . 28
Evaluation . . . 29

5 Resolution 30

Checking the resolution and minimum contrast . . . 30
- Requirements . . . 30
- Evaluation of resolution and minimum contrast . . . 30
- Evaluation of resolution without prefiltration . . . 32

6 Capillary test 33

Dynamic test . . . 33

Capillary visibility test during fluoroscopy . . . 33
Capillary visibility test during subtraction . . . 34
Capillary visibility test for roadmap . . . 36
Pixelshift function . . . 39

7 Contrast 40

Edge enhancement, contrast enhancement and object movements . . . 40
Edge enhancement . . . 40
LUT selection change . . . 40
Motion unsharpness . . . 41

8 Checking the Controls 43

9 Digital preprocessing 45

Digital preprocessing . . . 45
Auto-Gamma . . . 45
Checking camera rotation . . . 46
Vignetting compensation . . . 47

10 Image disturbances 49

Image disturbances (artifacts) . . . 49
Definition of the assessment numbers . . . 49
Description of the artifacts . . . 50
Evaluation of the image disturbances . . . 51

11 Local printer 52

Local Printer - Sony UPD970 / UPD 990 . . . 52
Function Check . . . 52

12 3D resolution 53

Preparation . . . 54
Testing . . . 56
Measurement sequence . . . 61
Checking 3D resolution . . . 64
Determining the optimal slice plane for testing 3D resolution . . . 64
Evaluation . . . 66

13 3D calibration (Orbic 3D only) 68

Adjustment of the calibration phantom . . . 68
Calibration without mounted navigation attachment . . . 71
Required material . . . 71
Calibration with mounted navigation attachment . . . 72
Checking the overall accuracy of the 3D navigation . . . 74
Possible errors and corrective measures . . . 77

14 Final work steps 78

Customer-specific organ programs (exam sets) 78
Checking newly programmed ADR control characteristics 78
Protective conductor test 80

15 Changes to previous version 81

Notes and symbols

The signal words are used and classified in anticipation of the new Medical Solutions CS standard which is based on ANSI standard Z535.4.

Text emphasized in technical documentation has the following meaning:

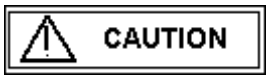
Tab. 1 GEFAHR / DANGER

	Bei einer unmittelbar drohenden Gefahr, die bei Nichtvermeidung zum Tod oder zu einer schweren Körperverletzung **führt**.
	Indicates when there is an immediate danger that **leads** to death or serious physical injury.

Tab. 2 WARNUNG / WARNING

	Bei einer Gefahr, die bei Nichtvermeidung zum Tod oder zu einer schweren Körperverletzung **führen kann**.
	Indicates a risk of danger that **may lead** to death or serious physical injury.

Tab. 3 VORSICHT / CAUTION

	Bei einer Gefahr, die bei Nichtvermeidung zu einer leichten oder mittleren Körperverletzung und/ oder zu einer Sachbeschädigung führt oder führen kann.
	Indicates a risk of danger that leads to slight or moderate physical injury and/or damage to property.

Tab. 4 ACHTUNG / NOTICE

	Bei einer Gefahr, die bei Nichtvermeidung zu einem unerwünschten Ergebnis oder Zustand führt oder führen kann (**nicht** Tod, Körperverletzung oder Sachbeschädigung).
	Indicates a risk of danger that if disregarded leads or may lead to a potential situation which may result in an undesirable result or state (**not** death, physical injury or property damage).

Tab. 5 HINWEIS / NOTE

HINWEIS	Ist als Tipp zu verstehen. Der Anwender muss diese Anweisung nicht unbedingt beachten. Er erfährt jedoch Vorteile, wenn er dies tut.
NOTE	Should be understood as a tip. The user does not absolutely have to observe these instructions. However, there will be advantages if he does.

General safety information (in existing documents)

⚠WARNING

Danger of injuries, death or material damage.

Non-compliance can lead to death, injury or material damage.

Please note:

- **➪ The product-specific safety information in the start-up instructions and system service documentation**
- **➪ The general safety information in TD00-000.860.01... and**
- **➪ The safety information in accordance with ARTD Part 2.**

System identification

Material no.: _____ Serial no.: _____
Customer/clinic: _____
Address: _____ City: _____
State/province: _____ Country: _____
Phone no.: _____ Contact person: _____
System no.: _____ Office: _____
Responsible system engineer: _____

Image quality acceptance in the factory performed completely and documented by:

Name (block letters): _____ Dept.: _____
Signature: _____ Date: _____

Customer installation date: _____

IQ quick test performed at:

Handover to customer ❒ During maintenance ❒

Settings deviating from the standard based on:

Country-specific regulations ❒ Spec. customer wishes ❒

Reasons: _____
_____

Name (block letters): _____ Office: _____

Signature: _____

Required measuring equipment and tools

• Set of X-ray filters, 10 x 0.3 mm Cu		44 06 120 RV090
• Precision X-ray filter, 2.1 mm Cu		99 00 598 XE999
• 25 mm AL measuring stand, type 26765 acc. to DIN 6868 Part 50 or 1.2 mm Cu from the X-ray filter set 17 m Cu strips		97 98 596 G5321 and 11 67 662 G5247
• Resolution test set type 41		28 71 820 RE999
• Densitometer	e.g. X-Rite 331	97 02 416 Y1996
	or PTW-BC21 including black check Type 5321 and light box type 53213	
• Dynamic test case		37 90 156 X1963
	or	97 50 001 X1963
containing:	TV dynamic test	37 90 164 X1963
	Heart contour diaphragm	37 90 172 X1963
	Capillary test	37 90 180 X1963
	Bracket	87 13 901 X1963
	Veiling glare test	87 09 743 X1963
• SMfit Spotmeter		77 52 848
• 3D calibration phantom		75 51 620 G5486

Requirements

Basic measuring conditions

- Complete operable system - ensure that
  - The grid is attached to the I.I. input.
  - The cover is attached to the SIREPHOS over the tube collimator.
- A "mid" level fluoro dose rate means: (full format; setting tolerance +/- 10%)

23 cm I.I.:	0,185 µGy/s - fluoro (at the I.I. input), grid factor 1.5 must be used.

- The setpoints listed in the following chapters apply for a "mid" dose level; in the case of deviating settings, setpoints may have to be adapted.
- When requested to switch
  - Noise reduction k-factor
  - Edge
  - Motion detection
  - Fluoroscopic characteristic
  - Or other parameters in the organ programs, select or change a correspondingly predefined organ program or, if possible, change the parameter directly in the examination task card.
- The "Service_X_..." exam sets in "General, All Body Region" must be activated prior to starting work in the ExamSet Editor and returned to the hidden pool after completion of the work. See the following paragraph "Loading/unloading the exam sets relevant for the IQ test"

Activating, deactivating, and selecting the exam sets relevant for the IQ test

NOTE

Exam sets relevant for the IQ test were predefined to simplify image quality testing and can be loaded.

During normal operation, these are not active and are not visible to the customer.

The exam sets relevant for the IQ test must be activated prior to conducting the image quality test.

These exam sets must then be deactivated after completion of the IQ test.

Activating the exam sets relevant for the IQ test

- Select the "Options" - "Configuration" menu after system start-up.
  - ➪ The "syngo configuration panel" window is displayed.

- Double-click on the "Examination set configuration" icon.
  - ➪ The "Examination set configuration" window is displayed.
- Select the "General" task card in the "Examination set configuration" window.

NOTE

For the exam sets relevant for the IQ test to be visible, no patient region may be selected in the graphic, virtual patient anatomy representation.

If a patient region is selected and is displayed lighter than its surroundings, click once in the gray field to the left or right outside of the image.

This deselects the previously selected patient region and it is no longer displayed lighter than its surroundings.

- All available exam sets are displayed in the "Examination set pool" field in the "Examination set configuration" window.
  - ➪ Already active exam sets have a light appearance.
  - ➪ Inactive exam sets are gray.
- Select each exam set, beginning with "SERVICE_.....", and copy it to the "Active examination sets" field by clicking on the button with the down arrow.
  - ➪ All exam sets, beginning with "SERVICE_...", are displayed in the "Active examination sets" field.
- Click on the "Apply" button.
- Click on the "OK" button.
  - ➪ The "Examination set configuration" window closes.
  - ➪ The exam sets relevant for the IQ test can be selected in the examination task card after a patient is opened under "General".

Deactivating the exam sets relevant for the IQ test

- Select the "Options" - "Configuration" menu after system start-up.
  - ➪ The "syngo configuration panel" window is displayed.
- Double-click on the "Examination set configuration" icon.
  - ➪ The "Examination set configuration" window is displayed.
- Select the "General" task card in the "Examination set configuration" window.

NOTE

For the exam sets relevant for the IQ test to be visible, no patient region may be selected in the graphic, virtual patient anatomy representation.

If a patient region is selected and is displayed lighter than its surroundings, click once in the gray field to the left or right outside of the image.

This deselects the previously selected patient region and it is no longer displayed lighter than its surroundings.

- All available exam sets are displayed in the "Active examination sets" field in the "Examination set configuration" window. Active exam sets have a light appearance.
- Select each exam set, beginning with "SERVICE_.....", and remove it from the "Active examination sets" field by clicking on the button with the up arrow.
  - ➪ All exam sets, beginning with "SERVICE_...", are no longer displayed in the "Active examination sets" field.
- Click on the "Apply" button.
- Click on the "OK" button.
  - ➪ The "Examination set configuration" window closes.
  - ➪ The exam sets relevant for the IQ test are no longer available in the examination task card after a patient is opened under "General".

Selecting the exam sets relevant for the IQ test in the examination task card

- After system start-up, perform a patient registration for the IQ test.
- After loading, the exam sets relevant for the IQ test can be selected in the examination task card.
- Select "General" in the list field above the graphic, virtual patient anatomy representation.
- The exam sets relevant for the IQ test (beginning with "SERVICE_....") can then be selected in the list field below the graphic, virtual patient anatomy representation.

Loading the ASPIA test images relevant for the IQ test

NOTE

The ASPIA test images relevant for the IQ test are not selectable during normal system operation.

To load the images, the local service must be open.

- Call up the local service on the system ("Options" - "Service" - "Local service" menu) and enter the password.
- Leave the local service open during use of the necessary test images.
- Open the patient browser.
  - ➪ The available test images are saved and retrievable under the following path: "Patient" - "Patient list" - "Local database" - "Service patient" - "Test images".
- If the test images are no longer needed, close the open test images and terminate the local service.

Orbic tableside control (overview)

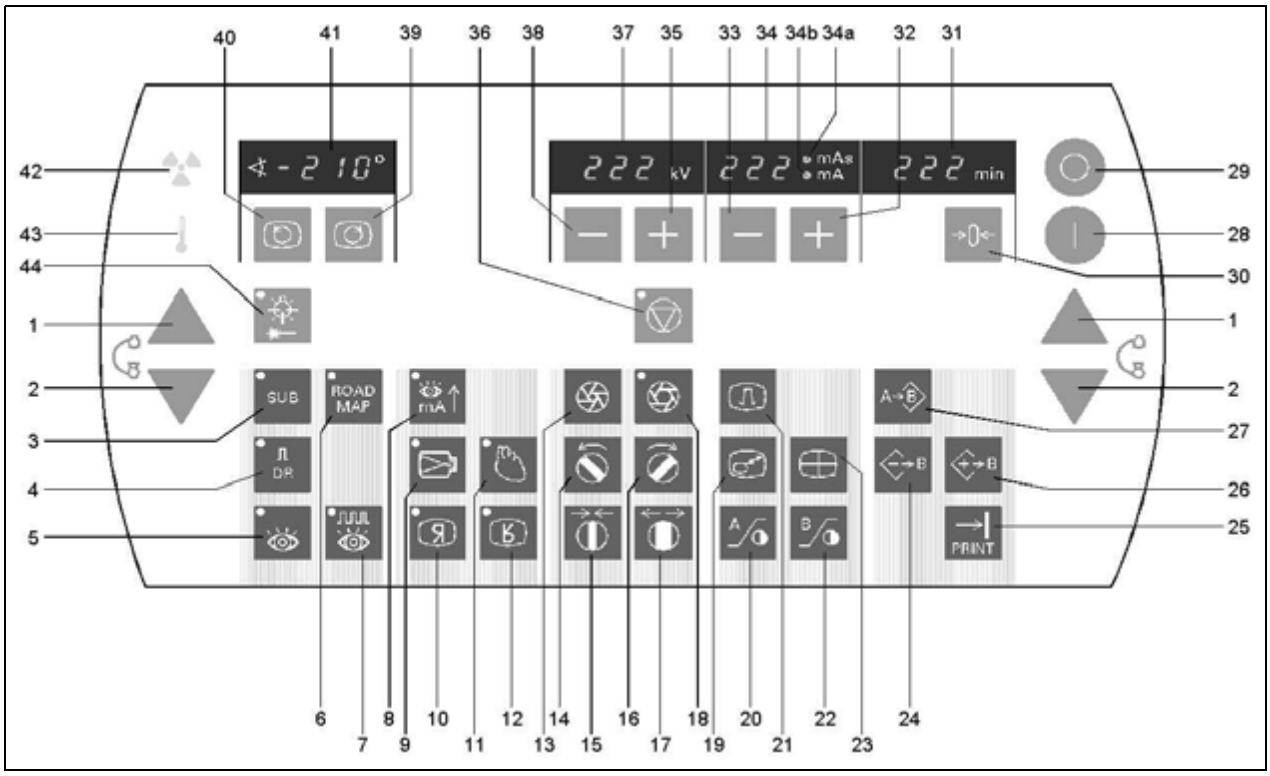


*Fig. 1: Control console_*

Button	Function
1	Raise lifting column
2	Lower lifting column
3	Subtraction (with LED)
4	Digital radiography (with LED)
5	Fluoroscopy (with LED)
6	Roadmap (with LED)
7	Pulsed fluoroscopy (with LED)
8	Power mode (with LED)
9	I.I. zoom (with LED)
10	Image rotation left/right (with LED)
11	Selection of the noise reduction factor (with LED)
12	Image rotation top/bottom (with LED)
13	Close iris diaphragm
14	Rotate the slot diaphragm to the left

15	Close the slot diaphragm
16	Rotate the slot diaphragm to the right
17	Open the slot diaphragm
18	Open the iris diaphragm
19	Electronic zoom
20	Contrast setting (LUT selection) for monitor A
21	Edge enhancement
22	Contrast setting (LUT selection) for monitor B
23	Screen split
24	Read image from memory (-)
25	Activate documentation unit
26	Read image from memory (+)
27	Save image
28	Switch on the system
29	Switch off the system
30	Reset fluoro buzzer
32	mAs adjustment (+)
33	mAs adjustment (-)
35	kV(mA) adjustment (+)
36	kV regulation stop (with LED)
38	kV(mA) adjustment (+)
39	Image rotation right
40	Image rotation left
44	Laser light localizer (with LED)

- **Button LEDs (red)**

LED in button	Function
3	Lights when subtraction is selected
4	Lights when digital radiography is selected
5	Lights when fluoroscopy is selected
6	Lights when the SUB "Roadmap" mode is selected

7	Lights when pulsed fluoroscopy is selected
8	High-contrast fluoroscopy (with LED)
9	Lights when I.I. zoom is selected
10	Lights when image rotation left/right is selected
11	Lights when a smaller K factor is selected
12	Lights when image rotation top/bottom is selected
18	Lights when the iris diaphragm is completely open in the exposure position
36	Lights during kV regulation in stop operation
44	Lights when the laser light localizer is switched on

- **LEDs in the display (red)**

LED in button	Function
34a	Lights when exposure (mAs) is selected
34b	Lights when the exposure mode is not selected (mA)

- **LED display surface**

LED	Function
42	Display lights when radiation is released
43	Display lights at a tube temperature of > 50 ^{o}C and blinks at a tube temperature of > 70 ^{o}C

- **7-segment display**

Display	Function
31	Fluoro time
34	mA/mAs display
37	kV display
41	Image rotation display

Varic tableside control (overview)

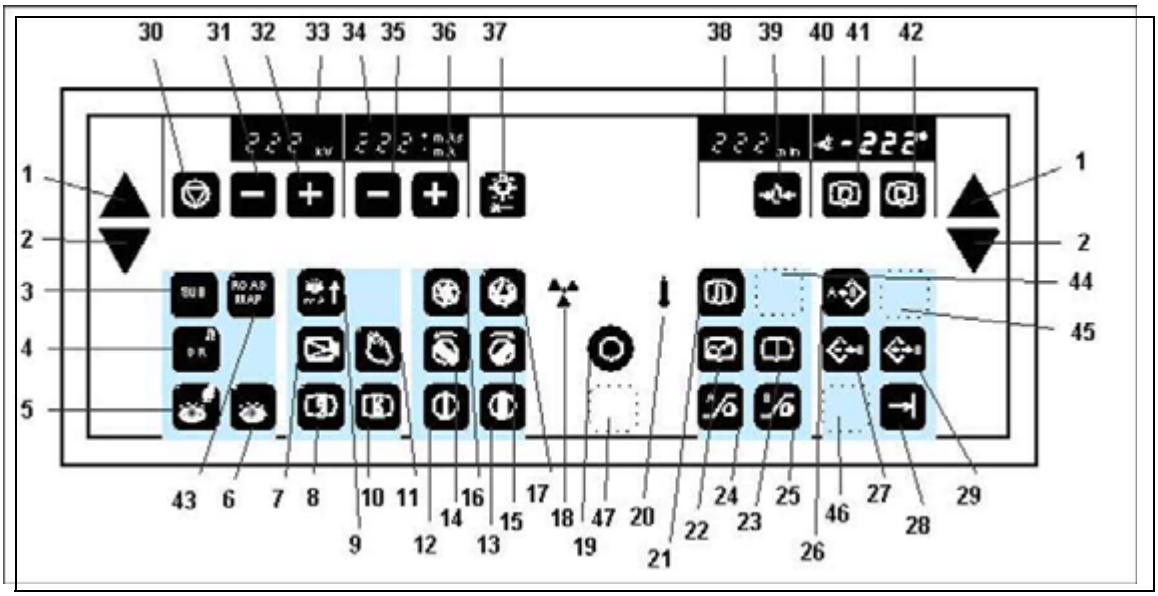


Fig. 2: Control console

Button no. .	Function	Remarks
1	Upward lifting column	
2	Downward lifting column	
3	Subtraction mode (SUB)	Button with LED
4	Digital radiography mode (DR)	Button with LED
5	Pulsed fluoroscopy mode (PFC)	Button with LED
6	Fluoroscopy mode (CFC)	Button with LED
7	I.I. zoom	Button with LED
8	Image rotation left/right (horizontal)	Button with LED
9	Power mode	Button with LED
10	Image rotation top/bottom (vertical)	Button with LED
11	Noise suppression (K factor selection change)	Button with LED
12	Filter diaphragm closed	
13	Filter diaphragm open	
14	Filter diaphragm - rotate left	
15	Filter diaphragm - rotate right	
16	X-iris diaphragm closed	
17	X-iris diaphragm open	Button with LED
19	Power off	

21	Edge enhancement	1
22	Memory (electr.) zoom	
23	Screen split	
24	Contrast setting - monitor A	
25	Contrast setting - monitor B	
26	Store image (during radiation ATB function)	
27	Read image from memory (-)	1
28	Activate documentation unit	
29	Read image from memory (+)	1
30	kV control stop	Button with LED
31	kV adjustment (-)	2
32	kV adjustment (+)	2
35	mAs adjustment (-)	2
36	mAs adjustment (+)	2
37	Laser light localizer on	Button with LED
39	Reset fluoro buzzer	
41	Image cursor left	
42	Image cursor right	
43	Roadmap mode (ROADMAP)	
44	Reserve 1	3
45	Reserve 2	3
46	Reserve 3	3
47	Power on	3

1. With autorepeat function, implemented in the image store
2. With autorepeat function starting from 1s at an interval of 0.3s
3. Equipped but not accessible from the front panel and not labeled

Available monitors

- Check off the available monitor (color monitor or monochrome monitor).
- Check off the manufacturer of the monitor.
- Enter the monitor type according to the type label of the manufacturer in the type field.

Color monitors ❒ available

Manufacturer	Eizo ❒ Yes	SIEMENS ❒ Yes
Type	.....	.....

Monochrome monitors ❒ available

Manufacturer	Barco ❒ Yes
Type	.....

Monitor brightness

- Load the SMPTE calibration test image (ASPIA test images).
- Measure the 100% bright field via SMfit spotmeter.

NOTE **Do not exert any pressure on the LCD display of the monitor during the measurement with the SMfit spotmeter.**

- Switch off the ambient light sensor, if present.

Color monitors

	Luminance setpoint:	Factory Measured luminance:	Place of use Measured luminance:
Left monitor **100% bright field**	200 cd/m^2 +/- 20 cd/m^2 *1 *2	..... cd/m^2	..... cd/m^2
Right monitor **100% bright field**	200 cd/m^2 +/- 20 cd/m^2 *1 *2	..... cd/m^2	..... cd/m^2
*1 Tolerance specifications in the delivery state. *2 SIEMENS TFT Display, Type DSC 1904: Allowable tolerance: +20 / -40 cd/m^2 The monitor is worn out when the maximum adjustable luminance has fallen below 120 cd/m^2.			
Remarks:			

Monochrome monitors

	Luminance setpoint:	Factory Measured luminance:	Place of use Measured luminance:
Left monitor **100% bright field**	410 cd/m^2 +/- 20 cd/m^2 *1	..... cd/m^2	..... cd/m^2
Right monitor **100% bright field**	410 cd/m^2 +/- 20 cd/m^2 *1	..... cd/m^2	..... cd/m^2
*1 Tolerance specifications in the delivery state. The monitor is worn out when the maximum adjustable luminance has fallen below 350 cd/m^2.			
Remarks:			

Monitor contrast

- Load the SMPTE calibration test image (ASPIA test images).
- Switch off the ambient light sensor of the monitor, if present.
- Measure the 0% dark field via SMfit spotmeter.

NOTE

Do not exert any pressure on the LCD display of the monitor during the measurement with the SMfit spotmeter.

- Use the luminance measured in the "Monitor brightness" section in the 100% bright field to calculate the contrast.
- Calculate the contrast as follows and enter it in the table:

$$\text{Contrast} = \frac{\text{Monitor, measured luminance in 100\% bright field}}{\text{Monitor, measured luminance in 0\% dark field}}$$

Color monitors

	Setpoints	Factory	Place of use
Left monitor 0% dark field	Luminance setpoint: ≤1 cd/m^2	Measured luminance: ..... cd/m^2	Measured luminance: ..... cd/m^2
Left monitor Contrast	Contrast setpoint: ≥ 200 *1	Calculated contrast:	Calculated contrast: .....
Right monitor 0% dark field	Luminance setpoint: ≤1 cd/m^2	Measured luminance: ..... cd/m^2	Measured luminance: ..... cd/m^2
Right monitor Contrast	Contrast setpoint: ≥ 200 *1	Calculated contrast:	Calculated contrast: .....

*1 SIEMENS TFT Display, Type DSC 1904: Allowable contrast: ≥ 180

Monochrome monitors

	Setpoints	Factory	Place of use
Left monitor 0% dark field	Luminance setpoint: ≤1 cd/m^2	Measured luminance: ..... cd/m^2	Measured luminance: ..... cd/m^2
Left monitor Contrast	Contrast setpoint: ≥ 350	Calculated contrast:	Calculated contrast: .....
Right monitor 0% dark field	Luminance setpoint: ≤1 cd/m^2	Measured luminance: ..... cd/m^2	Measured luminance: ..... cd/m^2
Right monitor Contrast	Contrast setpoint: ≥ 350	Calculated contrast:	Calculated contrast: .....

Visual evaluation of the SMPTE calibration test image

- Display the SMPTE calibration test image on both monitors.
- Visually evaluate the SMPTE calibration test image on both monitors.

Factory	Left monitor	Right monitor
All gray values are clearly visible:	❒ Yes / ❒ No	❒ Yes / ❒ No
The 5% field and the 95% field are visible:	❒ Yes / ❒ No	❒ Yes / ❒ No

Place of use	Left monitor	Right monitor
All gray values are clearly visible:	❒ Yes / ❒ No	❒ Yes / ❒ No
The 5% field and the 95% field are visible:	❒ Yes / ❒ No	❒ Yes / ❒ No

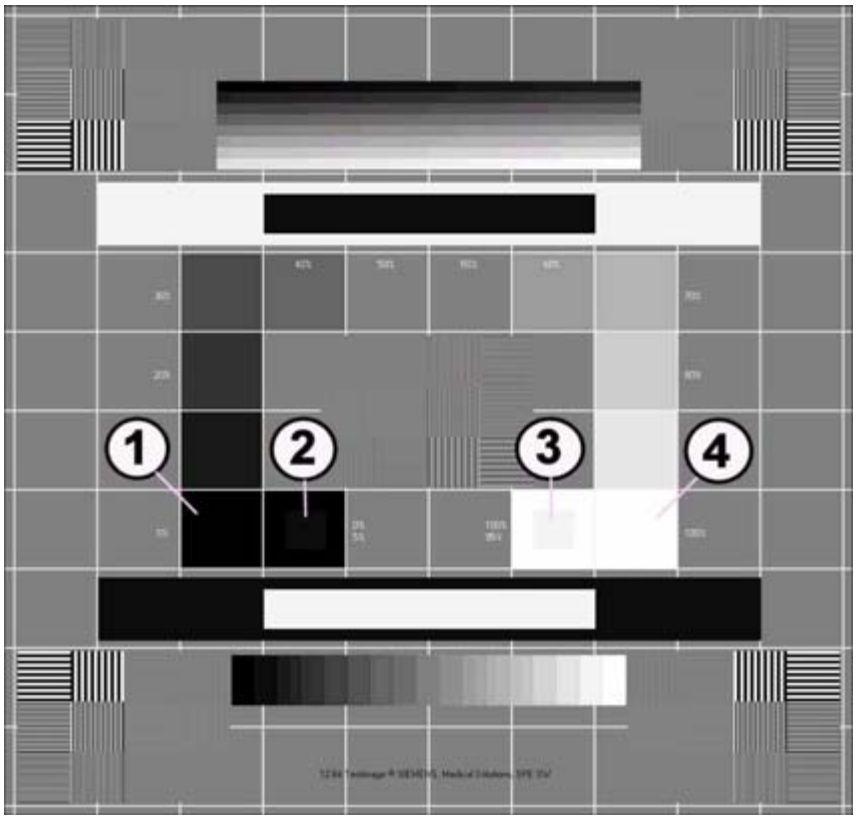


Fig. 3: SMPTE calibration test image

Pos. 1 0% field

Pos. 2 5% field

Pos. 3 95% field

Pos. 4 100% field

Requirements

- The indicated exam sets must be selected for fluoroscopy, pulsed fluoroscopy, and DR. See the "Loading the exam sets relevant for the IQ test" section.
- Attach a 2.1mm Cu precision X-ray filter for prefiltration in the area of the radiation outlet.
- All exposures are pre-contrast images (no additional object in the beam path).

Evaluation

NOTE

The specified exam sets must be used for the checks.

The activation of the exam sets is described in the introduction chapter.

ADR control characteristics for the fluoroscopy mode

- Select fluoro.
- Select I.I. full format.
- Select the General, All region, "SERVICE_Q_HC1_Mid" exam set.

  ➪ The mid level dose rate is selected.

- Radiation on.
- Read off the kV and mA values displayed on the monitor.
- Radiation off.
- Enter the values in table 1, line HC1.
- Fluoro and I.I. full format remain selected,
- Select the General, All region, "SERVICE_Q_HC2_Mid" exam set.

  ➪ The mid level dose rate is selected.

- Radiation on.
- Read off the kV and mA values displayed on the monitor.
- Radiation off.
- Enter the values in table 1, line HC2.
- The actual values documented in the factory must be obtained again at the place of use. Admissible deviations: Tube voltage (kV) ± 1 kV, tube current (mA) ± 10 %.

Tab. 6

Cont. fluoro **ADR control characteristics (included in the exam set)**	**Setpoints**		**Actual values**			
			Factory		**Place of use**	
	kV	mA	kV	mA	kV	mA
HC 1 (General, All region, SERVICE_Q_HC1_Mid)	66 - 68	2.0 - 2.8				
HC 2 (General, All region, SERVICE_Q_HC2_Mid)	65 - 67	2.2 - 3.2				

ADR control characteristics for pulsed fluoroscopy mode

- Select pulsed fluoro.
- Select I.I. full format.
- Select the General, All region, "SERVICE_Q_HC1_Mid" exam set.
  ➪ The mid level dose rate is selected.
- Pulse frequency 8 (7.5) pulses per second

- Radiation on.
- Read off the kV and mA values displayed on the monitor.
- Radiation off.
- Enter the values in table 2, line HC1.
- Pulsed fluoro and I.I. full format remain selected.
- Select the General, All region, "SERVICE_Q_HC2_Mid" exam set.
  ➪ The mid level dose rate is selected.

- Radiation on.
- Read off the kV and mA values displayed on the monitor.
- Radiation off.
- Enter the values in table 2, line HC2.
- The actual values documented at the factory must be obtained again at the place of use. Admissible deviations: Tube voltage (kV) ± 1 kV, tube current (mA) ± 10%.

Tab. 7

Pulsed FLUORO ADR control characteristics (included in the exam set)	**Setpoints**		**Actual values**			
			Factory		**Place of use**	
	kV	mA	kV	mA	kV	mA
HC1 (General, All region, SERVICE_Q_HC1_Mid)	65 - 66	14.5 - 20.8				
HC2 (General, All region, SERVICE_Q_HC2_Mid)	65 - 66	16.3 - 23.0				

ADR control characteristics for DR mode

- Select DR.
- Select I.I. full format.
- Select the General, All region, "SERVICE_Q_HC2_Mid" exam set.

  ⇨ The mid level dose rate is selected.

- Radiation on.
- Read off the kV and mAs values displayed on the monitor.
- Radiation off.
- Enter the values in table 3, line DR 1000W.
- The actual values documented in the factory must be obtained again at the place of use. Admissible deviations: Tube voltage (kV) ± 1 kV, tube current (mA) ± 10 %.

Tab. 8

DR takeover	Setpoints		Actual values			
			Factory		Place of use	
	kV	mAs	kV	mAs	kV	mAs
DR 1000W (General, All region, SERVICE_Q_HC2_Mid)	66 - 67	3,6 - 5,9				

Prerequisite

Place a long, thin, straight object (e.g. stretched solder wire) near the I.I. - at an exact right angle to the C-arm orientation.

Place a second object next to it - for direction determination (see (Fig. 4 / p. 28)).

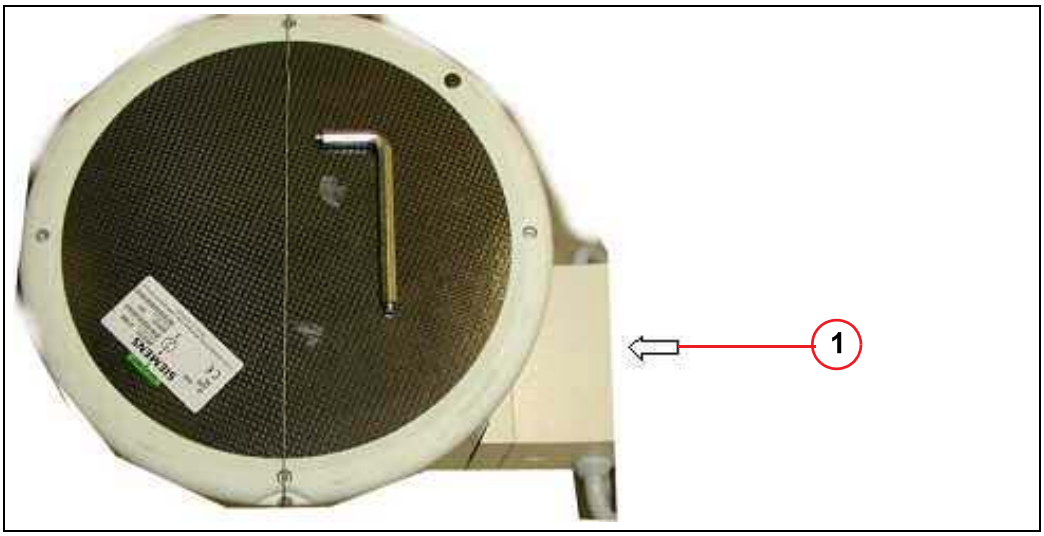


Fig. 4: Image position
Pos. 1 C-arm alignment

The rotation angle of the image on the display of the basic unit must be 0.

If necessary, set the angle to 0.

Record an image (see (Fig. 5 / p. 28)).

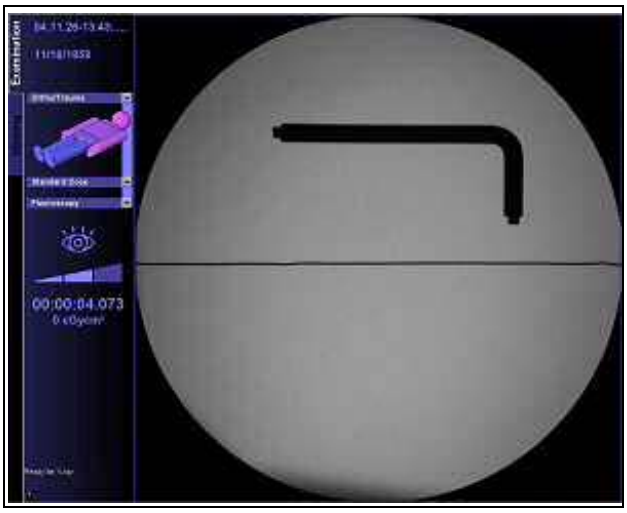


Fig. 5: Output image

Evaluation

The object must appear on the screen in an exactly horizontal position.

	Factory				Place of use			
Image position OK?	❒	Yes	❒	No	❒	Yes	❒	No

Checking the resolution and minimum contrast

Requirements

- Use a resolution test type 41 (factory and place of use).
- Attach the resolution test directly to the I.I. grid in the center of the I.I. at an angle of approx. 90 degrees with respect to the grid lines (45 degrees with respect to the CCD structure).
- In the factory: Place a 25 mm AL measuring stand on the I.I.
- Place of use: If the 25 mm AL measuring stand (with 0.4 mm recess) is available, attach it near the I.I., otherwise attach the 17 µm Cu strip directly to the I.I. grid next to the resolution test. Additionally place a 1.2 mm Cu filter in the beam path. Fading at the I.I. edge can be eliminated via collimation.
- Select the indicated operating mode (fluoro/pulsed fluoro/DR (1000W)) according to the "Resolution" table.
- Additionally select the indicated exam set after selecting the appropriate operating mode (fluoro/pulsed fluoro/DR(1000W)).

- Radiation "on".

NOTE	**If overexposure occurs at the I.I. edge, collimate accordingly.**

- Set the monitor contrast to optimum resolution.
- Set the edge enhancement to optimum resolution.
- Radiation OFF.

Evaluation of resolution and minimum contrast

- Determine the resolution of the LIH image and enter it in the Resolution table.

NOTE **Use the electronic zoom function and windowing in the viewing task card if necessary.**

Tab. 9 Resolution

Operating mode	I.I. format	23 cm I.I. setpoints for resolution	Actual resolution values [LP/mm]	
			Factory	Place of use
FLUORO (HC2) (General, All region, SERVICE_Q_HC2_Mid)	Full format	≥ 1.8 LP/mm		
FLUORO (HC2) (General, All region, SERVICE_Q_HC2_Mid)	Zoom 1	≥ 2.2 LP/mm		
Pulsed FLUORO (HC2) (General, All region, SERVICE_Q_HC2_Mid)	Full format	≥ 1.8 LP/mm		
Pulsed FLUORO (HC2) (General, All region, SERVICE_Q_HC2_Mid)	Zoom 1	≥ 2.2 LP/mm		
DR (1000W) (General, All region, SERVICE_Q_HC2_Mid)	Full format	≥ 1.8 LP/mm		
DR (1000W) (General, All region, SERVICE_Q_HC2_Mid)	Zoom 1	≥ 2.2 LP/mm		

- Also check the minimum contrast during the resolution test and enter it in the Minimum contrast table.

Is the minimum contrast visible?

Tab. 10 Minimum contrast

Factory					Place of use				
Full format	❑	Yes	❑	No	Full format	❑	Yes	❑	No
Zoom	❑	Yes	❑	No	Zoom	❑	Yes	❑	No

Evaluation of resolution without prefiltration

- Then remove the 25 mm Al or 1.2 mm Cu prefilter.
- Collimate to the resolution test.
- Perform the resolution test for DR again without prefilter as above.

Tab. 11 Evaluation of resolution without prefiltration

Operating mode	I.I. format	Setpoints Resolution	Actual value Resolution [lp/mm]	
			Factory	Place of use
		23 cm I.I.	Monitor 1	Monitor 1
DR (1000W) (General, All region, SERVICE_Q_HC2_Mid)	Full format	≥ 2.2 LP/mm		
DR (1000W) (General, All region, SERVICE_Q_HC2_Mid)	Zoom 1	≥ 2.8 LP/mm		

NOTE

2.4 LP/mm should be obtained in full format.

However, when using resolution test type 41, resolution level 2.4 LP/mm is not available and cannot be checked.

Dynamic test

SUBTRACTION option present: If no: The sections Capillary visibility test during subtraction, Capillary visibility test for roadmap, and Pixelshift function do not apply.	Yes	No

NOTE

The dynamic test in conjunction with the plexi capillary test is used to detect small contrast differences.

Capillary visibility test during fluoroscopy

Measuring setup

- Remove the 1.2mm Cu precision X-ray filter from the beam path.
- Attach the dynamic test without holder but with heart contour diaphragm and plexi capillary test right in front of the I.I. input. The plexi capillaries are close to the I.I.

Requirements

- Select full format.
- Select the General, All region, "SERVICE_Q_HC2_Mid" exam set. The mid level dose rate is selected.
  - ➪ The "mid" level dose rate is selected.
- Select high noise reduction. (The LED in button 11 of the control console (heart button) does not light up).
- Set edge enhancement to the lowest level (button).
- Select linear LUT (LUT G1).

Evaluation of the monitor image

- Switch radiation on and evaluate the live image during radiation.
- Check off non-visible plexi capillaries in (Fig. 6 / p. 34) (from left to right 2L - 1 - 5R).

Setpoints

- ➪ The plexi capillaries not identified in (1 /Fig. 6 / p. 34) must be visible.

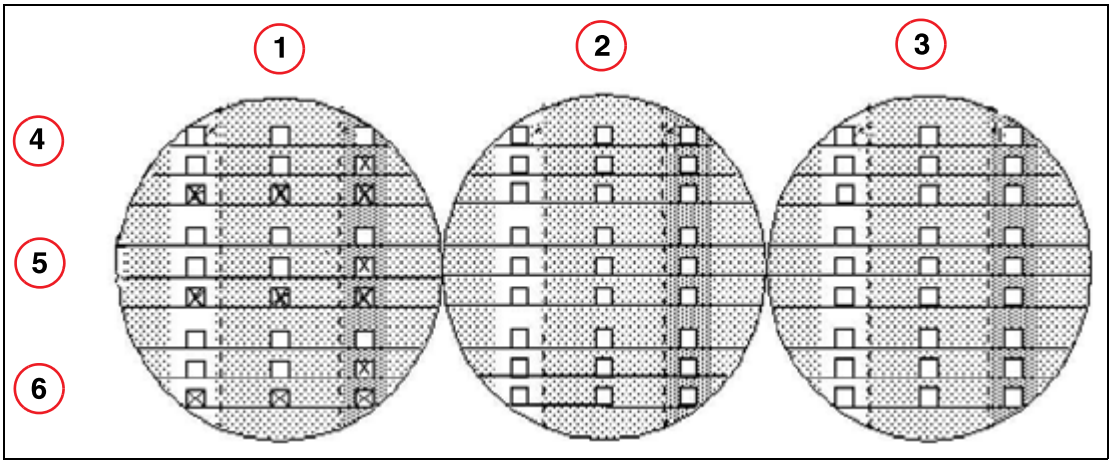


Fig. 6: Monitor image

Pos. 1	Target value
Pos. 2	Factory
Pos. 3	Place of use
Pos. 4	Group 3-mm wide
Pos. 5	Group 2-mm wide
Pos. 6	Group 1-mm wide

Capillary visibility test during subtraction

Measuring setup

- Attach the dynamic test without holder but with heart contour diaphragm and plexi capillary test right in front of the I.I. input. The plexi capillaries are close to the I.I.
- Mechanically clamp the plexi capillary test to be able to move the plexi capillaries via the rubber ball during the subtraction exposure.

Requirements

- Select full format.
- Select the "General, All region, SERVICE_Q_HC2_High" exam set.
  - ➪ The dose rate level is set to "high."
- Select subtraction.
- Set edge enhancement to the lowest level (button).
- Select SUB LUT 3MH (pre-setting)

Trigger subtraction

- Switch radiation on.
  - ➪ After 3 seconds of radiation, the mask is set automatically.
- Then cause the plexi capillary test to move by pressing the rubber ball.
- After another 3 seconds, switch the radiation off.

Evaluation of the capillary visibility

- Use the mouse in the scrollbar to scroll back in the viewing task card to where the white and black capillaries are best visible (2 to 3 images).

NOTE

For improved visibility,

SUB LUT 4MH can also be selected as needed.

NOTE

Do not evaluate the first white line.

Start the evaluation with the first black line.

- Check off non-visible black plexi capillaries in the "Subtraction, black lines" table (from left to right 2L - 1 - 5R).
- Check off non-visible white plexi capillaries in the "Subtraction, white lines" table (from left to right 2L - 1 - 5R).

Setpoints

➪ The black plexi capillaries not identified in the "Setpoints" column of the "Subtraction, black lines" table must be visible.

➪ The white plexi capillaries not identified in the "Setpoints" column of the "Subtraction, white lines" table must be visible.

Tab. 12 Subtraction, black lines

	Setpoints			Factory			Place of use			
	2L	**1**	**5R**	**2L**	**1**	**5R**	**2L**	**1**	**5R**	**Group**
Black										Top group 3 mm wide
Black			**X**							
Black	**X**	**X**	**X**							
Black										Middle group 2 mm Width
Black			**X**							
Black	**X**	**X**	**X**							
Black										Bottom group 1 mm wide
Black			**X**							
Black	**X**	**X**	**X**							

Tab. 13 Subtraction, white lines

	Setpoints			Factory			Place of use			
	2L	1	5R	2L	1	5R	2L	1	5R	Group
White										Top group 3 mm wide
White			X							
White	X	X	X							
White										Middle group 2 mm wide
White			X							
White	X	X	X							
White										Bottom group 1 mm wide
White			X							
White	X	X	X							

Evaluation of visual brightness impression

- On monitor A, evaluate the white, 3-mm capillary line in fields 2L, 1 and 5R. There may not be any noticeable difference in brightness in the fields.

	Factory	Place of use
No noticeable difference in brightness visible in fields 2L, 1 and 5R:	❑ Yes ❑ No	❑ Yes ❑ No

Capillary visibility test for roadmap

Measuring setup

- Attach the dynamic test without holder but with heart contour diaphragm and plexi capillary test right in front of the I.I. input. The plexi capillaries are close to the I.I.
- Mechanically clamp the plexi capillary test to be able to move the plexi capillaries via the rubber ball during the subtraction exposure.

Requirements

- Select full format.
- Select the General, All region, "SERVICE_Res_HC2_Mid" exam set. The mid level dose rate is selected.
  - ➪ The "mid" level dose rate is selected.
- Select roadmap.

- Set edge enhancement to the lowest level (button).
- Select SUB LUT 3MH (pre-setting)

Start roadmap

- Switch radiation on (phase A).
  - ➪ After 3 seconds of radiation, the mask is set automatically (phase B).
- Do **not** move the plexi capillary test (rubber ball).
- After another 3 seconds, switch the radiation off.

- Switch radiation on again (phase C).
  - ➪ The LUT must switch to SUB LUT 3R (pre-setting). Given a correct change from SUB LUT 3MH to SUB LUT 3R, the image background changes from light to dark.
- Move the plexi capillary test by pressing the rubber ball.
- Radiation remains switched on during the evaluation.

Evaluation of the capillary visibility

- Radiation remains switched on during the evaluation.

NOTE

Do not evaluate the first white line.

Start the evaluation with the first black line.

- Check off non-visible black plexi capillaries in the "Roadmap, black lines" table (from left to right 2L - 1 - 5R).
- Check off non-visible white plexi capillaries in the "Roadmap, white lines" table (from left to right 2L - 1 - 5R).
- After the capillary visibility is evaluated, switch radiation off.

Setpoints

- ➪ The black plexi capillaries not identified in the "Setpoints" column of the "Roadmap, black lines" table must be visible.
- ➪ The white plexi capillaries not identified in the "Setpoints" column of the "Roadmap, white lines" table must be visible.

Tab. 14 Roadmap, black lines

	Setpoints			Factory			Place of use			
	2L	**1**	**5R**	**2L**	**1**	**5R**	**2L**	**1**	**5R**	**Group**
Black										Top group 3 mm wide
Black		**X**	**X**							
Black	**X**	**X**	**X**							

	Setpoints			Factory			Place of use			
	2L	1	5R	2L	1	5R	2L	1	5R	Group
Black										Middle group 2 mm wide
Black		X	X							
Black	X	X	X							
Black										Bottom group 1 mm wide
Black		X	X							
Black	X	X	X							

Tab. 15 Roadmap, white lines

	Setpoints			Factory			Place of use			
	2L	1	5R	2L	1	5R	2L	1	5R	Group
White										Top group 3 mm wide
White		X	X							
White	X	X	X							
White										Middle group 2 mm wide
White		X	X							
White	X	X	X							
White										Bottom group 1 mm wide
White		X	X							
White	X	X	X							

Evaluation of LUT change from phase B to phase C

- As described in the "Start roadmap" section, SUB LUT 3R must automatically be selected when changing to phase C.

	Factory		Place of use	
LUT changed when changing from phase B to phase C:	❑ Yes	❑ No	❑ Yes	❑ No

Pixelshift function

Prerequisite

The subtraction image from the roadmap test is available.

- Select the roadmap image in the Viewer.
- Select pixelshift in the SUB task card.

Evaluation

- Using the arrow tool, move the mask successively in all directions:
  ➪ Apart from the black and white edge strips, no artifacts may occur.
- Using the Auto Pixelshift tool, select a location.
  ➪ In this location the shifted mask must return to artifact-free superimposition.

	Factory				Place of use			
Pixelshift function ok?	❒	Yes	❒	No	❒	Yes	❒	No

Edge enhancement, contrast enhancement and object movements

NOTE	**Only perform edge enhancement, LUT selection change, and motion unsharpness at the factory.**

Edge enhancement

Requirements

- Place the dynamic test without holder, with heart contour diaphragm and plexi capillary test on the I.I. input screen. The plexi capillaries are close to the I.I.
- Select the General, All region, SERVICE_Q_HC2_Mid exam set.
  ➪ The "mid" level dose rate is selected.
- Set edge enhancement to the lowest level.

- Release fluoroscopy briefly.
  ➪ Use the LIH image to evaluate the edge enhancement.

Evaluation of the monitor image

- Activate the button for selecting edge enhancement on the control console several times.
  ➪ The individual edge enhancement levels (20%, 40%, ...) are selected one after another.
- Evaluate the edge enhancement function.

	Factory			
Function control of edge enhancement OK? => The bright-dark transitions are clearly visible when a higher percentage edge enhancement level is selected.	❒	Yes	❒	No

LUT selection change

Requirements

- Place the dynamic test without holder, with heart contour diaphragm and plexi capillary test on the I.I. input screen. The plexi capillaries are close to the I.I.
- Select the General, All region, SERVICE_Q_HC2_Mid exam set.
  ➪ The "mid" level dose rate is selected.
- Set edge enhancement to the lowest level.

- Release fluoroscopy briefly.
  ➪ Use the LIH image to evaluate the LUT change.

Evaluation of the monitor image

- Activate the LUT change button.
  ➪ The image contrast changes.
- Evaluate the LUT selection function.

	Factory			
LUT change function OK?	❒	Yes	❒	No

Motion unsharpness

Requirements

- Remove the dynamic test without holder, with heart contour diaphragm and plexi capillary test from the I.I. input screen and place on a separate surface (e.g. table).
- Additionally attach a screwdriver in the center of the dynamic test.
- Position the C-arm with respect to the separate surface so that the dynamic test is over or under the I.I. input screen. The plexi capillaries are close to the I.I.

NOTE

If no suitable surface is available, the dynamic test with heart contour diaphragm and plexi capillary test can also be placed directly on the I.I. input screen.

An X-ray-absorbing object (e.g. long aluminum rod or the like) must by moved over the dynamic test in the beam path during radiation.

Pay attention to radiation protection!

- Select the General, All region, SERVICE_Q_HC2_Mid exam set.
  ➪ The "mid" level dose rate is selected.

Evaluation of the monitor image

- Fluoroscopy on.
- Move the C-arm horizontally during fluoroscopy.
  ➪ A smearing effect is clearly visible on the image during movement of the C-arm with respect to the capillary test.
- Radiation off.
- Select the pulsed fluoro operating mode.
  ➪ The "General, All region, SERVICE_Q_HC2_Mid" exam set remains selected.

- Radiation on (pulsed fluoro).

- Move the C-arm horizontally during pulsed fluoroscopy.
  - ➪ The object is visualized sharply but several times in the image during movement of the C-arm with respect to the capillary test.
- Radiation off.
- Evaluate the motion unsharpness test.
- Remove the additionally attached screwdriver.

	Factory			
Fluoro, pulsed fluoro functions OK?	❒	Yes	❒	No

Remarks

NOTE	**Perform only in the factory.**

The following controls are active for the specified prefiltration.

Automatic dose rate control (ADR)	with approximately 6 to 8 mm Cu and dynamic test in the beam path
Automatic TV iris collimator control (AIR)	with approximately 8 to 10 mm Cu and dynamic test in the beam path

The test is used to test the functioning of these controls.

Requirements

- Both monitors must be set to give approximately the same brightness and contrast impression (synchronism) (LUT, brightness and contrast setting).

Preparations

- Attach the dynamic test without holder and plexi capillary test, but with heart contour diaphragm, to the I.I.:
- Select the "General, All region, SERVICE_Q_HC2_Mid" exam set.
  - ➪ The mid level dose rate is selected.
- Select the fluoro operating mode.
- Switch the I.I. to full format.
- Completely open the collimator.
- Prefilter with Cu until 105 kV to 109 kV are displayed. To do this, switch on fluoroscopy briefly (approx. 6 mm to 8 mm Cu necessary).
  - ➪ Automatic dose rate control (ADR) is active.

- Radiation on.
- Select contrast linear LUT (LUT_Linear).
- Evaluate the brightness of the fluoroscopy image.
- Radiation off.
- Save the LIH image and display it on the reference monitor.

TV iris collimator control

- Additionally, attach 2.1 mm Cu to the radiation exit.

- Radiation on.
  - ➪ Generator limit 110 kV/5 mA must be reached.
  - ➪ The automatic TV iris collimator control (AIR) is active.
- Select contrast linear LUT (LUT_Linear).
- Evaluate the brightness of the fluoroscopy image.
- Radiation off.
- Save the LIH image.

- Display both images on both monitors.
  - ➪ Display the image saved during active ADR on the right monitor.
  - ➪ Display the image saved during active AIR on the left monitor.
  - ➪ Both images are displayed with the linear LUT (LUT_Linear).
- Evaluate the brightness impression of the fluoroscopic image generated during active AIR and compare it to that of the reference image generated during active ADR.
  - ➪ The brightness impression should be approximately the same.

Evaluation

	Factory	
Same brightness impression?	❑Yes	❑No

Digital preprocessing

NOTE	**Perform only in the factory.**

Auto-Gamma

Requirements

- Place the dynamic test without holder, with heart contour diaphragm and plexi capillary test on the I.I. input screen.
- Select the General, All region, SERVICE_Q_HC2_Mid exam set.
  - ➪ The mid level dose rate is selected.
- Set the monitor contrast to linear.
- Edge enhancement = on (10%)

Reading off the average (brightness) values

- Release fluoroscopy for approximately 10 seconds and save the image with the ATB button.
- Call up the local service (Option - Service - Local service + password).
  - ➪ When the Local service window is open and the measurement function is selected in the viewing task card, the corresponding brightness value (min/max/mean/SD%) can be displayed by selecting an image region via the mouse.
- Minimize the Local service window or move it to the right monitor.
- Select the previously stored image in the viewer.
- In the Tools menu bar of the imaging system, select **Measure ---> Rectangle** ↵.
- Select the 3 fields "2L", "1", and "5R". To do this, place the mouse pointer on a corner of the field to be measured and select the field according to the "display values" image while pressing the left mouse button.
  - ➪ The brightness values are displayed for every marked field.
- Read off the average brightness value (mean) for every field.
  - ➪ The average brightness value of the next darkest measuring surface should be between 40% and 60% of the average brightness value of the lighter measuring surface.
- Evaluate the Auto-Gamma function.

Evaluation of the monitor image

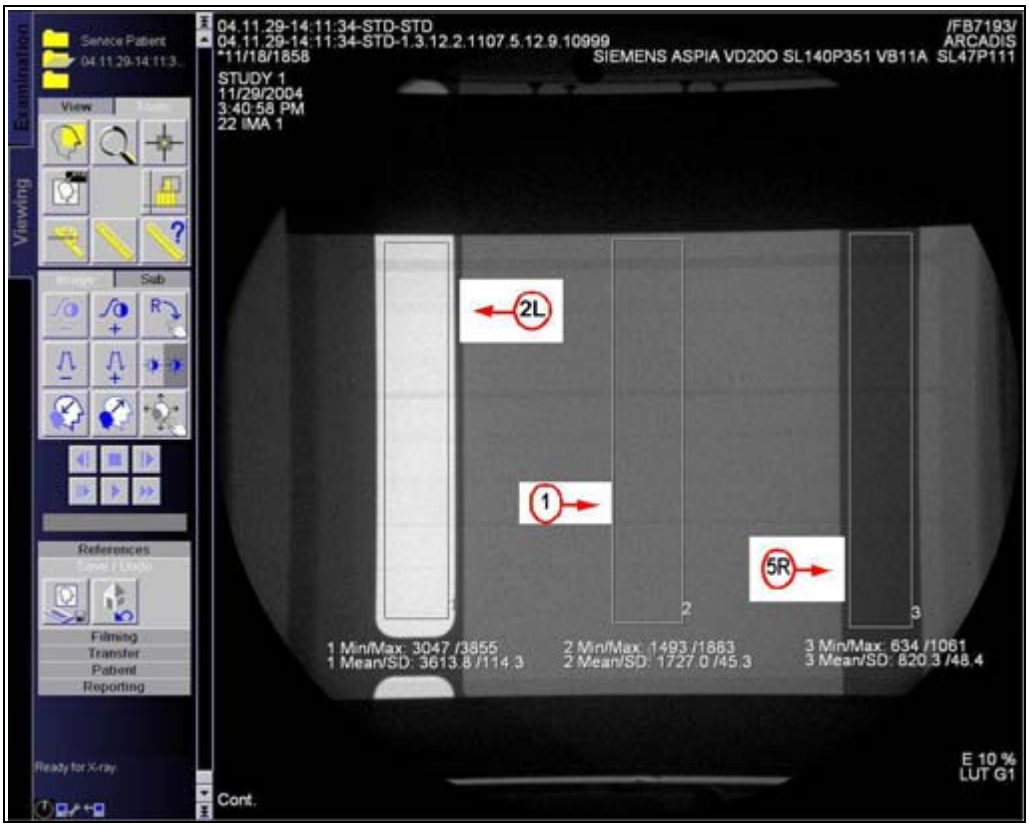


*Fig. 7: Display values_*

Auto-Gamma function OK?	❑ Yes	❑ No

Checking camera rotation

Requirements

- Place the dynamic test without holder, with heart contour diaphragm and plexi capillary test on the I.I. input screen.
- Select the General, All region, SERVICE_Q_HC2_Mid exam set.
  - ➪ The mid level dose rate is selected.
- Set the monitor contrast to linear.
- Edge enhancement = on (10%)

Test sequence

- Set the specified camera rotation angles.
- Record an image for each one.

- Evaluate the image with respect to artifacts.

Angles to be set (to be set on the C-arm control panel):

1°; 2°; 5°; 22°; 85°; 88°; 89°; 90°; 180°; 270°

Evaluation

Rotation function OK?	❑ Yes	❑ No

Vignetting compensation

Requirements

- Remove the dynamic test.
- Set the monitor contrast to linear.
- Attach a 2.1 mm Cu prefilter close to the tube.
- Select the General, All region, SERVICE_Q_HC2_Mid exam set.
  - ➪ The mid level dose rate is selected.

Test sequence

- Release fluoroscopy briefly and save the image via the ATB button.
- Call up the local service (Option - Service - Local service + password).
  - ➪ When the Local service window is open and the measurement function is selected in the viewing task card, the corresponding brightness value (min/max/mean/SD%) can be displayed by selecting an image region via the mouse.
- Minimize the Local service window or move it to the right monitor.
- Select the previously stored image in the viewer.
- In the Tools menu bar of the imaging system, select **Measure ---> Rectangle** ↵.
- Select the 5 fields according to the "measuring field" image. To do this, place the mouse pointer on a corner of the field to be measured and select the field according to the "display values" image while pressing the left mouse button.
  - ➪ The brightness data is displayed for every marked field.
- Read off the average brightness value (mean) for every field.
  - ➪ The average brightness value (mean) on the edge of the measuring fields should be no less than 75% of the average brightness value (mean) in the center measuring field.
- Divide the average (mean) of each of the fields at the edge by the average (mean) of the middle field and then multiply each result by 100 (brightness outside to brightness middle, in %)

Evaluation

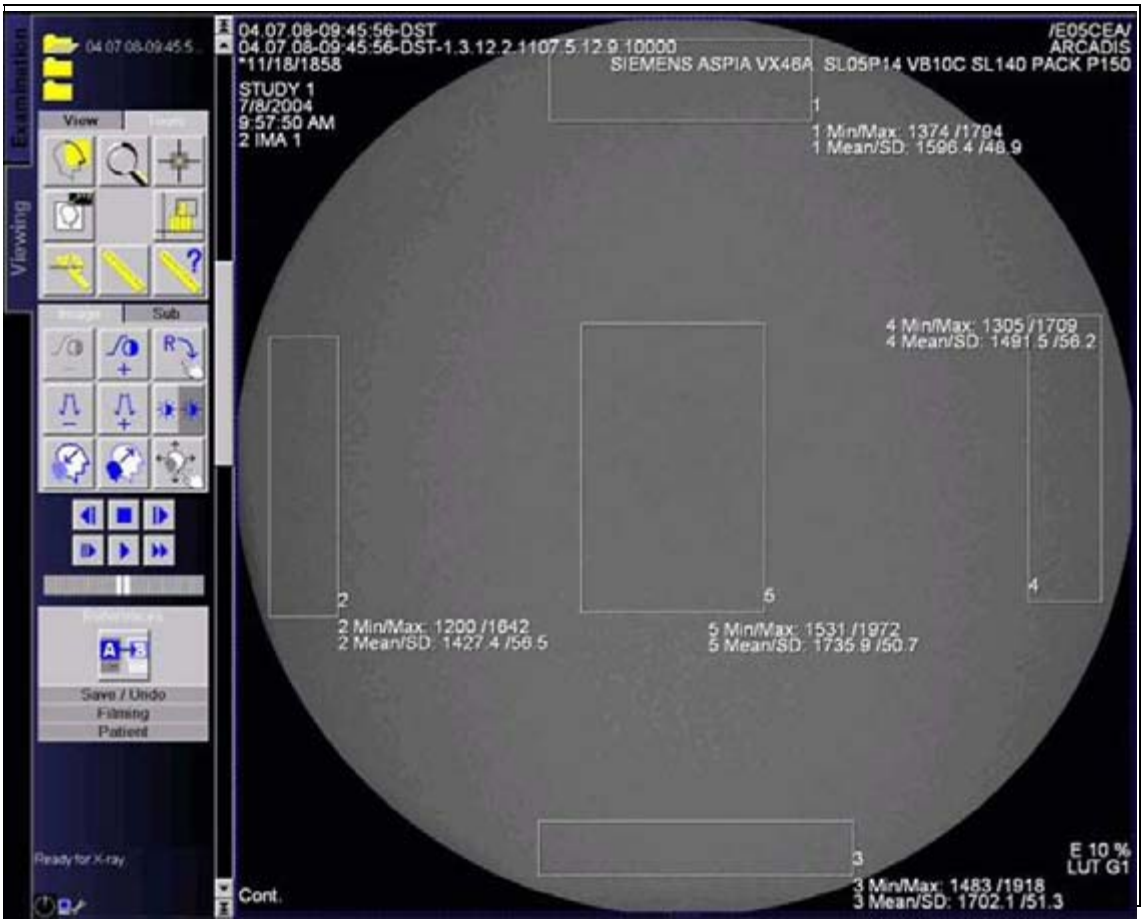


Fig. 8: Measuring field

- Evaluate the vignetting compensation function.

  ➪ The average brightness value (mean) on the edge of the measuring fields should be no less than 75% of the average brightness value (mean) in the center measuring field.

	Center scan field	Left measurement field [%]	Right measurement field [%]	Upper measurement field [%]	Lower measure-ment field [%]
Brightness value	_____	_____	_____	_____	_____
Brightness in %	n.a.	_____	_____	_____	_____

Image disturbances (artifacts)

- Check off all image disturbances determined during settings and IQ tests in the table in the IQ measuring protocol.
- If image disturbances are detected that are not listed in the table, describe them under "Other disturbances".
- Three assessment numbers indicating the extent of the disturbance are provided for each assessment of the relevant disturbance.

Definition of the assessment numbers

1 = No disturbances and artifacts were detected during start-up.

2 = Minor disturbances, artifacts occurred sporadically during start-up. The cause could not be localized and the "error" could not be corrected. The disturbances scarcely affect the good overall image impression, and the ability to make a medical diagnosis from the images is absolutely not impaired. Therefore, the artifacts are tolerable.

3 = During start-up, more frequent or stronger disturbances/artifacts occurred that disturb the overall impression of the image or impair the ability of the images to be diagnosed medically and are therefore no longer tolerable. The system must not be shipped or handed over to the operator in this condition.

Description of the artifacts

- **Hum:**

  Inconsistencies resulting from electromagnetic interference in the imaging systems are unattractive and disturbing. Depending on the nature of the disturbance, they can considerably impair the ability of the images to be evaluated and should ideally not occur at all. They are tolerable only to a very slight degree. Hum disturbances are visible as sporadic, horizontal light-dark patterns in the image; they are temporary and are not limited to a specific location.

- **Interference stripes:**

  Very high-frequency electromagnetic radiation is visible in the image as light or dark, sometimes very short horizontal lines (temporary). Interference stripes that are caused by dirt on optically effective surfaces must also be recorded here. They are limited to a specific location and are not temporary. Interference stripes are barely tolerable.

- **Ghost images:**

  These are object contours that are usually offset to one side and appear double. They are caused by reflections in poorly adapted, long video cables. Clearly visible ghost images are not tolerable.

- **Background structures** are permanent, grid-shaped patterns, primarily in dark image sections, that are also called "fixed noise".

- **Pixel errors** are image pixels without image information. They are visible on the monitor as dark or light pixel-size dots. There are tolerable and intolerable pixel errors. The TV camera is inspected very precisely in the test area for pixel errors and only TV cameras with pixel errors corresponding to an internal specification according to type and number are provided to customers. These tolerable pixel errors must be documented in the IQ measuring protocol.

Evaluation of the image disturbances

Setpoint for assessment of the disturbance: Only 1 and 2 are allowed.

	Factory			Place of use		
Nature of the disturbance, artifact	**Assessment of the disturbance *1**			**Assessment of the disturbance *1**		
	1	2	3	1	2	3
Hum						
Interference stripes						
Ghost images (reflections)						
Background structures						
Pixel errors ***2**						

Other disturbances:

_____

_____

_____

Comments:

_____

_____

_____

_____

_____

Remark: The image disturbance assessments must be recorded at the place of use.

***1** Assessment of the disturbances

1 = No disturbances, artifacts

2 = Slight disturbances, artifacts

3 = Intolerable disturbances, artifacts

***2** State the number and position of pixel errors under comments.

Local Printer - Sony UPD970 / UPD 990

NOTE	**If a hardcopy camera is to be connected, see "General Hardcopy Information", SPR2-310.814.25... (CB-DOC).**

Local printer available? If yes: camera type ..... If no: chapter not applicable.	❑Yes	❑No

Function Check

NOTE	**The Analog/Digital switch on printer UPD 970/990 has to be set to "Digital".**

- The local printer has to be connected and ready to operate.
- Open local service so that the service patient is displayed in the Patient Browser.

  ➪

Requirements

- Select the service patient in the Browser, load the SMPTE test image in the viewer, and print it at the local printer.

Evaluation

- The 5% and 95% fields in the printed SMPTE test image have to be discernible.

  ➪ If necessary, adjust the brightness / contrast using the control dials at the front of the printer, and repeat the test.

	Place of use	
Test OK?	❑ Yes	❑ No

Remarks:

_____

_____

_____

_____

NOTE

3D resolution is only performed for ARCADIS Orbic 3D.

NOTE

The 3D calibration menu option can only be performed if the 3D adjustment menu option was already performed completely and successfully.

NOTE

ARCADIS Orbic with 3D reconstruction:

During transport from the factory to the customer, the perpendicular for measuring the C-arm angulation may have rotated and be off by a full turn. The actual value potentiometer then delivers an incorrect actual value to the controller. This can prevent release of the 3D scan in the 3D function test when testing the image quality. Error messages are displayed.

If this happens, remove the cover on the cable module and check the position of both gears in the 0 degree C-arm angulation position.

The two marks on both gears must be exactly across from one another in the 0 degree angulation position.

If needed, rotate the perpendicular a full turn until the marks on the gears line up precisely.

Preparation

- Place the C-arm in the horizontal position with the image intensifier to the basic unit, see (Fig. 9 / p. 54).
- Mount resolution test 28 71 820 (type 41) horizontally on the stand for the calibration phantom.
- Position the resolution test in the isocenter of the C-arm, see (Fig. 10 / p. 54) and (Fig. 11 / p. 55).
- If available, the laser light localizer is to be used to determine the isocenter.

Fig. 9: Side view of the test setup

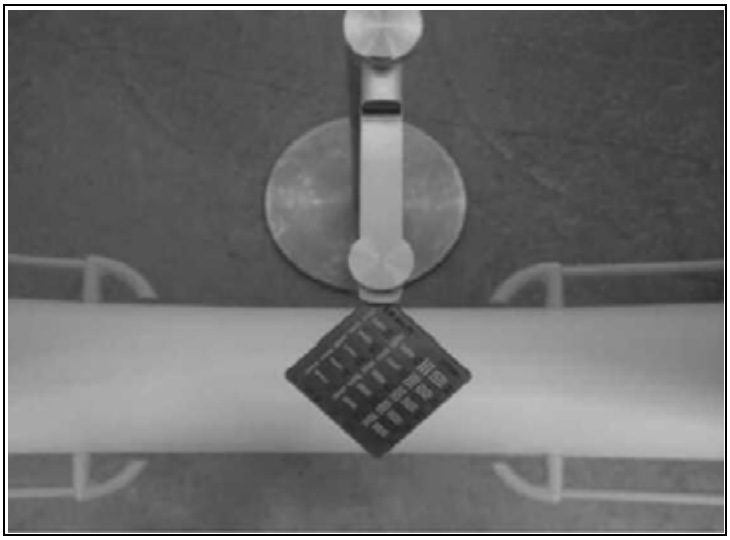


Fig. 10: Top view of the test setup

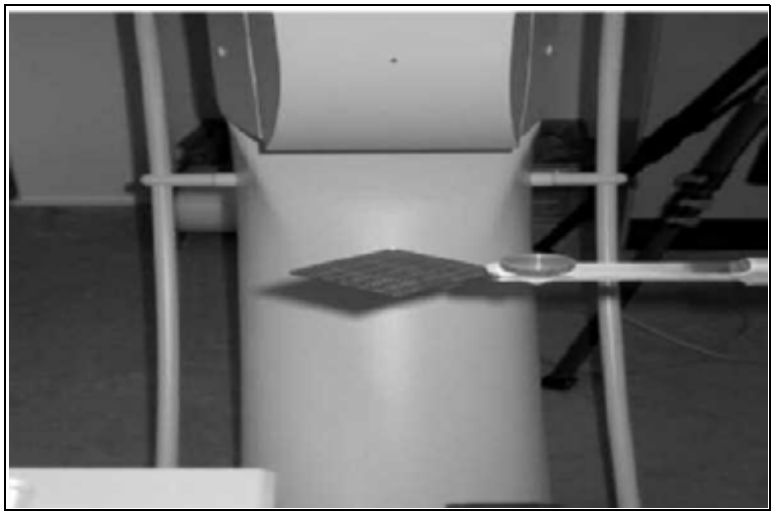


Fig. 11: Test setup as viewed from the I.I.

Testing

- Start the 3D scan by pressing the 3D button on the acquisition task card.
- The following exposure dialog is displayed on the right monitor (Fig. 13 / p. 57), and the syngo 3D task card is visible in the background (Fig. 12 / p. 56)

Fig. 12: syngo_start screen

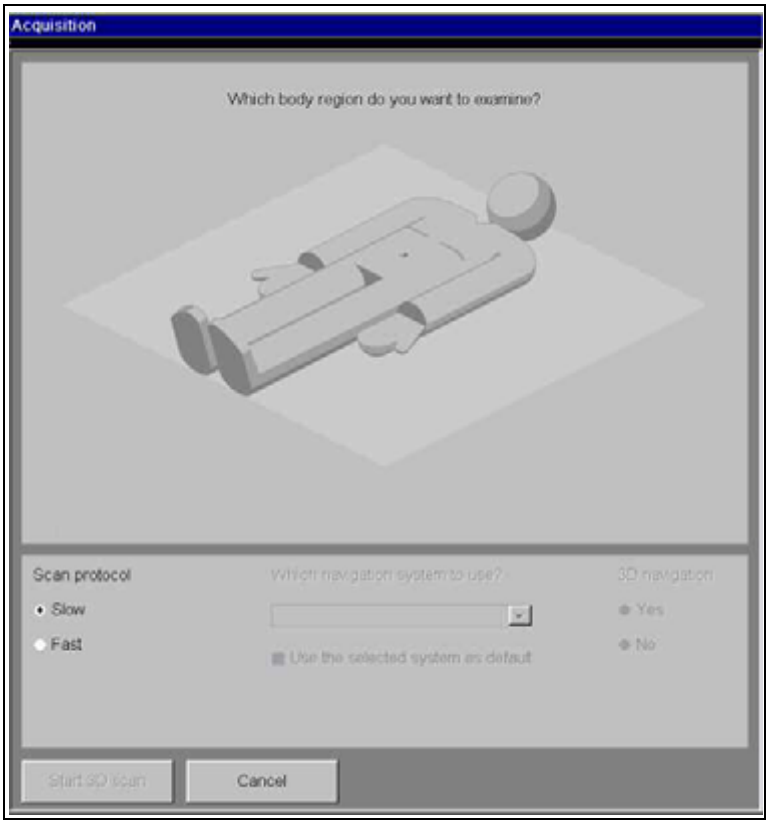


Fig. 13: Orientation menu

- Select a body region.

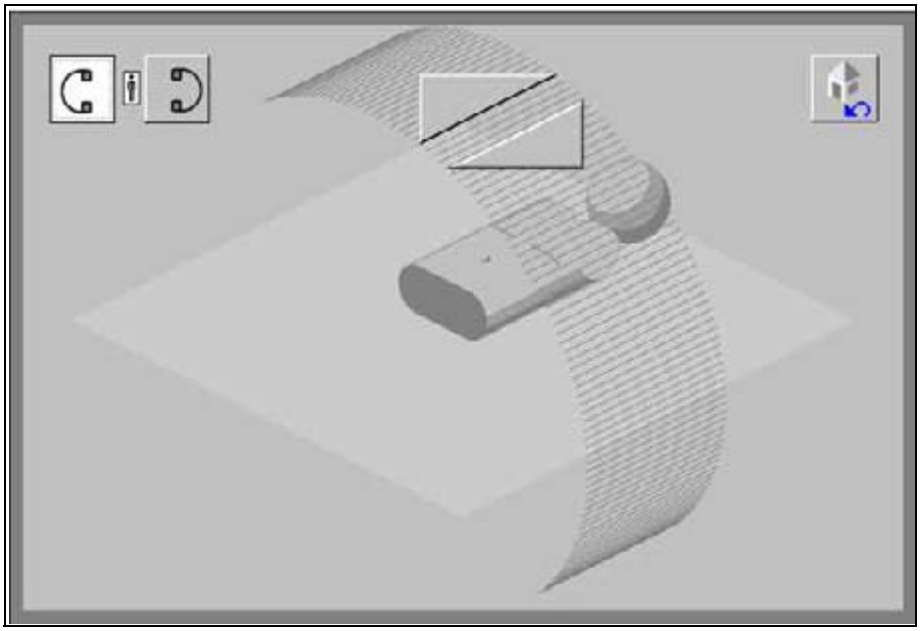


Fig. 14: Dialog box for patient position and beam direction

The indicated screen view is displayed, see (Fig. 14 / p. 57)

- Select the C-arm position.

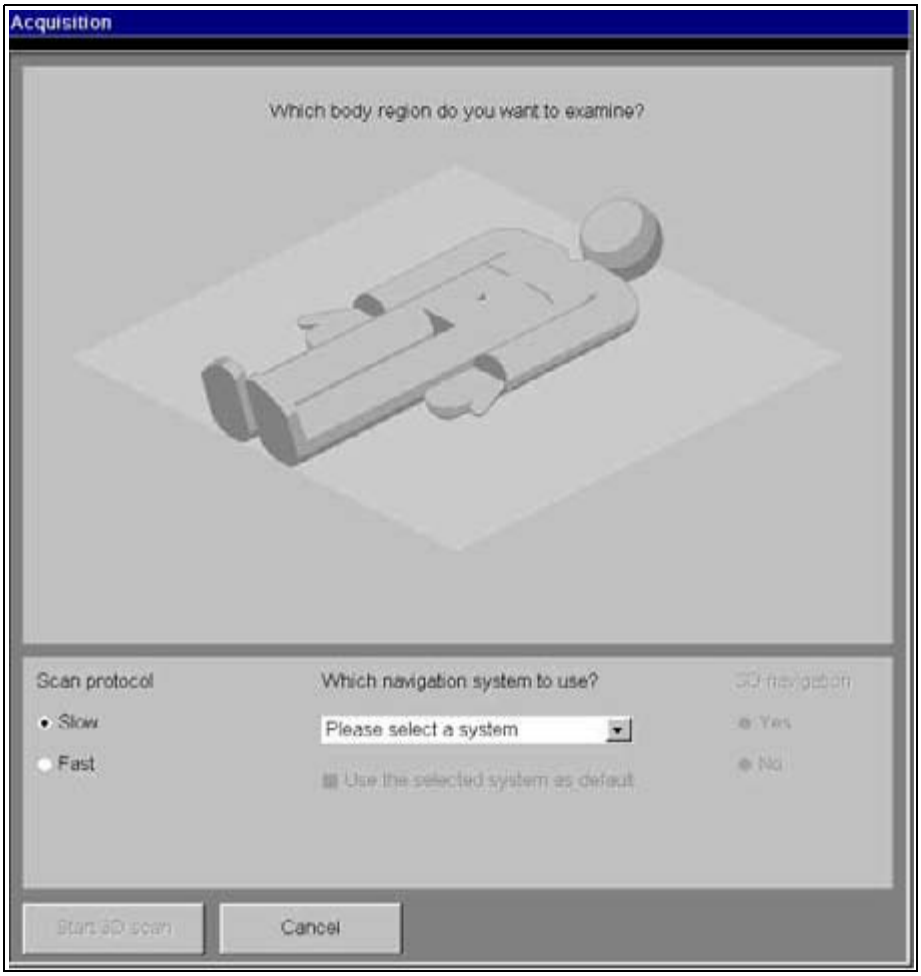


Fig. 15: Image 1

- Select the "slow" scan protocol
- If a navigation system is configured and mechanical installation parts of the navigation system for position determination are mounted on the I.I., select the corresponding navigation system (Fig. 15 / p. 58).
- Click the "start 3D scan" button.

The following screen view is displayed:

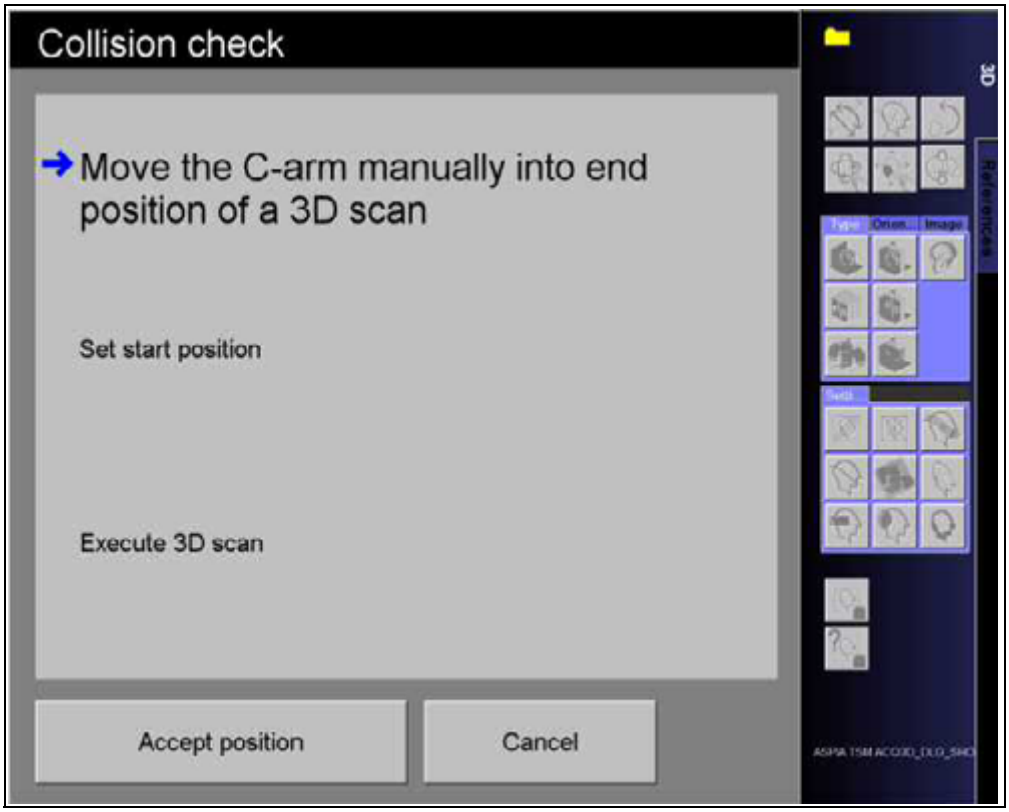


Fig. 16: Image 2

- Manually move the C-arm to the end position (to the limit switch).

The X-ray tube is then on the basic unit.

The following screen view is displayed (Fig. 17 / p. 60):

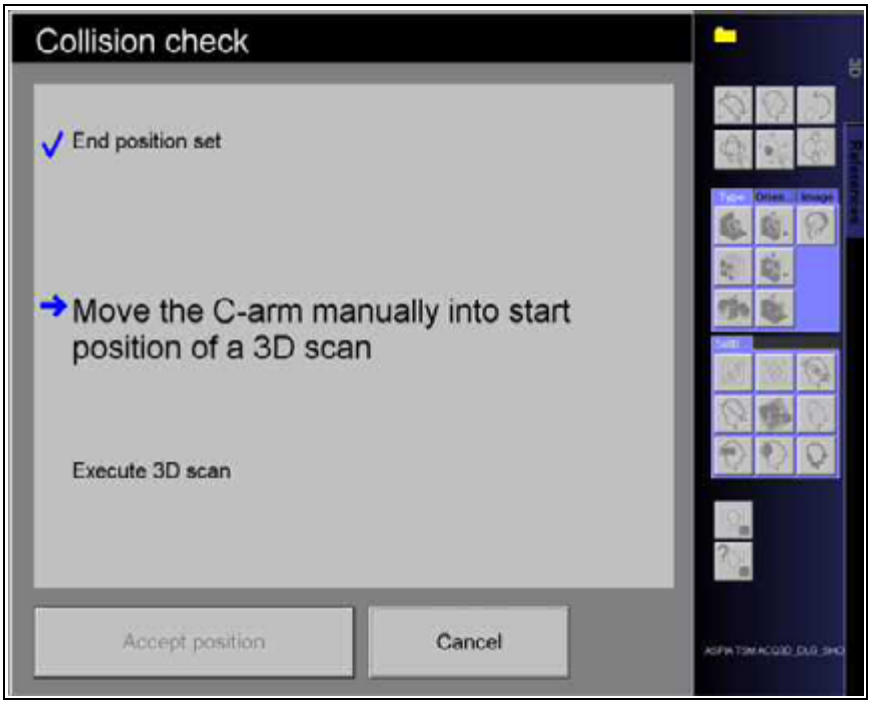


Fig. 17: Image 3

- Manually move the C-arm to the start position (to the limit switch).

The image intensifier is then on the basic unit.

After a successful manual test run, the following screen view is displayed (Fig. 18 / p. 60):

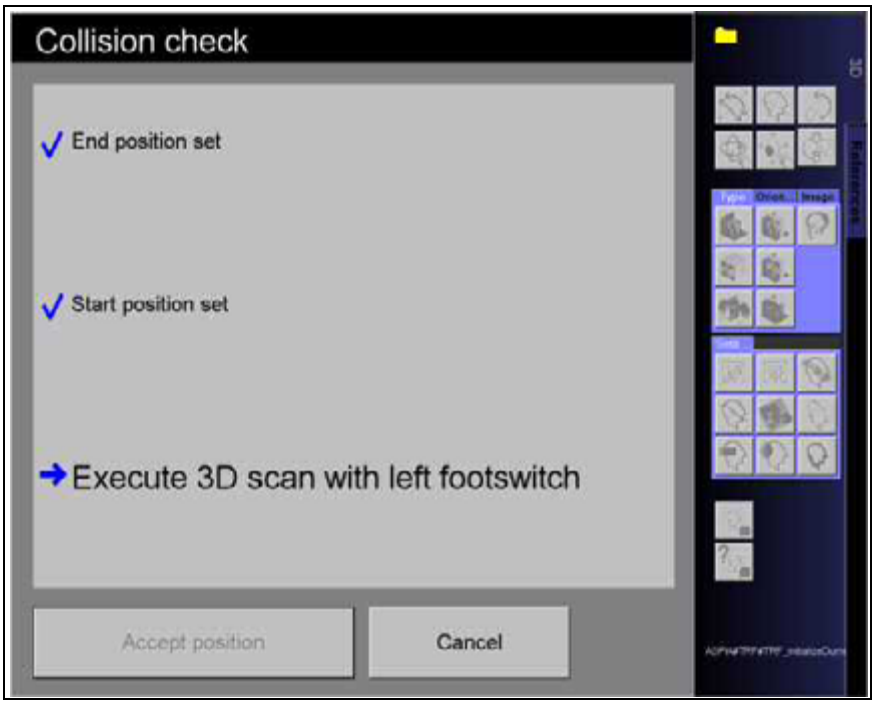


Fig. 18: Image 4

Measurement sequence

- Start the 3D scan with the left foot switch.
- Press and hold the foot switch until the scan is complete (approx. 1 minute)
- During the scan, observe the 2D images on the left monitor. The resolution test must remain in the isocenter.

  ➪ If the resolution test moves significantly out of the isocenter during the scan, the measurement must be stopped and the resolution test must be repositioned.

Resolution in 2D images

- Evaluate the 2D resolution in the 2D images (left monitor) during the scan.

NOTE	**Only 2D images in which the radiation hits the lead strip test vertically can be evaluated. The resolution test must be displayed two-dimensionally on the monitor.**

- Make a note of the resolution.

Maximum visible line pairs in 2D: .....

The following image (Fig. 19 / p. 61) is displayed during the scan:

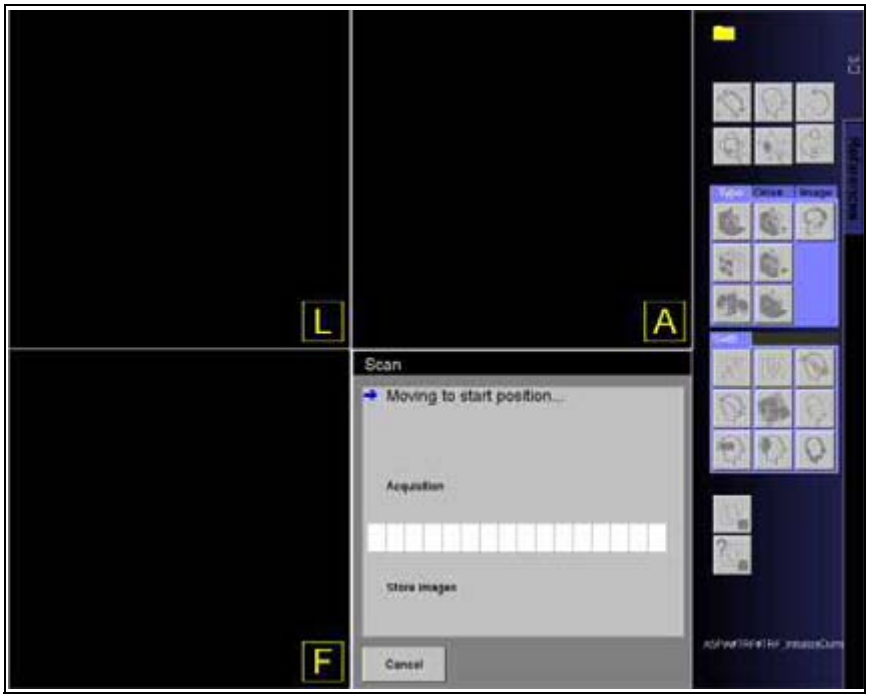


Fig. 19: Image 5

After a successful scan, the following image (Fig. 20 / p. 62) is displayed:

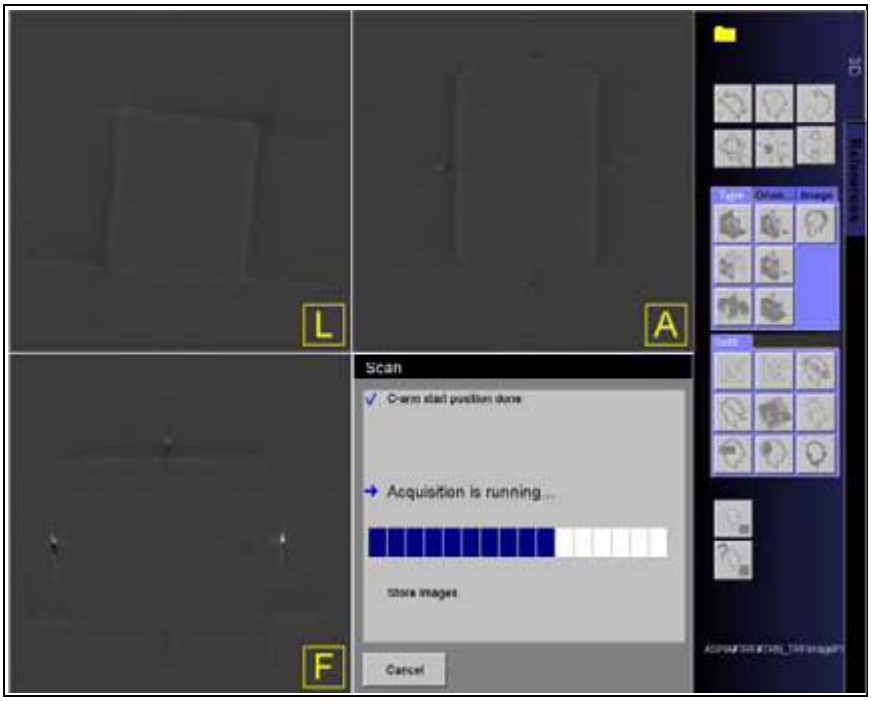


Fig. 20: Image 6

- Subsequently release the foot switch.

The reconstructed volume is automatically displayed in the MPR display in the 3D task card after recording (Fig. 21 / p. 63)

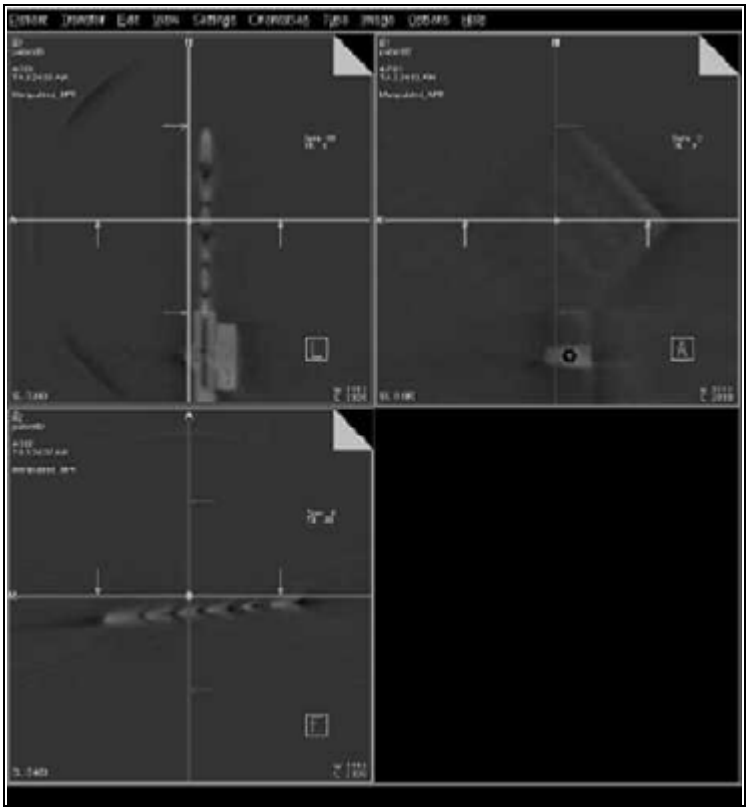


*Fig. 21: syngo image after successful recording and reconstruction_*

Checking 3D resolution

Determining the optimal slice plane for testing 3D resolution

- Use the vertical selection bar to select the the plane directly through the lead strip test (Fig. 22 / p. 64)
- Then use the horizontal bar to select a slice plane in the center of the lead line grid (Fig. 24 / p. 65)

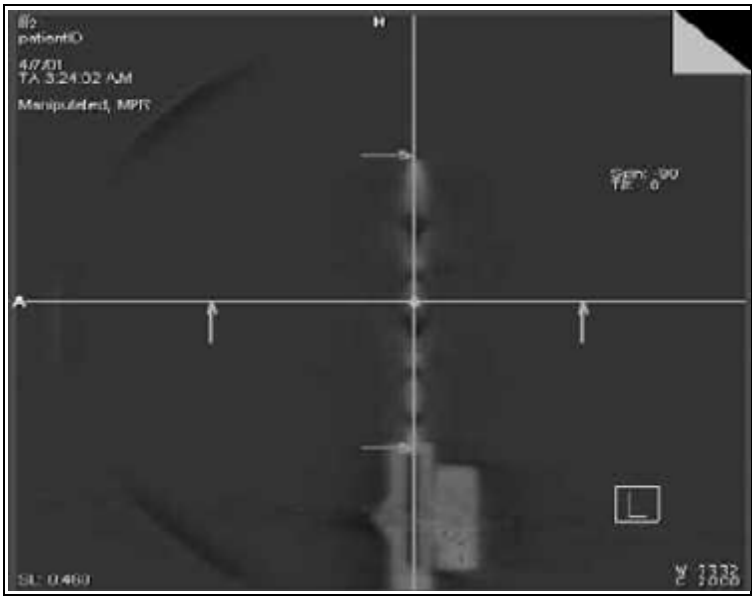


Fig. 22: Setting the slice plane in the top left window

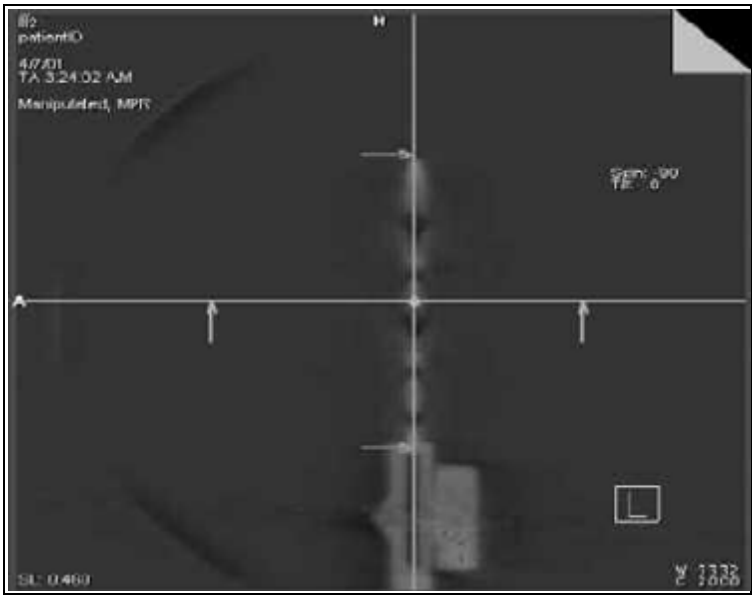


Fig. 23: Setting the slice plane in the top left window

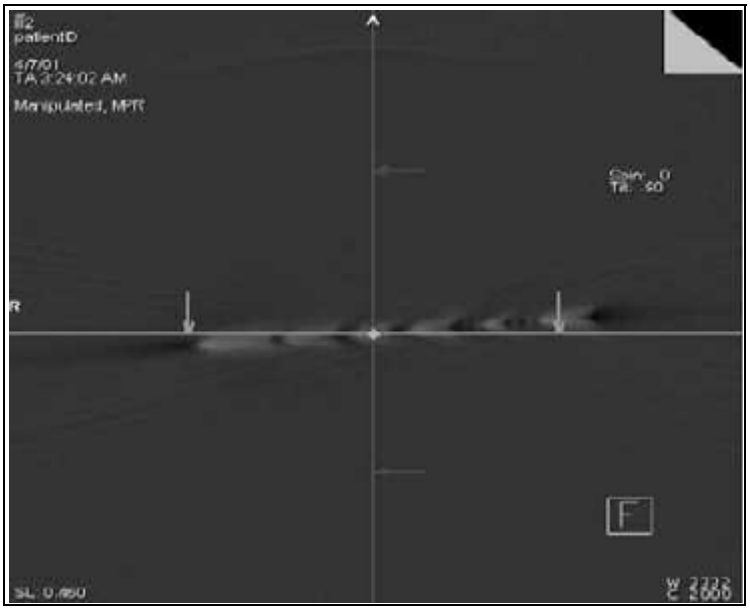


Fig. 24: Slice plane in the bottom left window

- If the lead strip test is tilted with respect to the display plane, the position of the slice plane is to be corrected with an open adjustment.
- A syngo image should show a slice plane parallel to the lead line grid, see (Fig. 25 / p. 65)

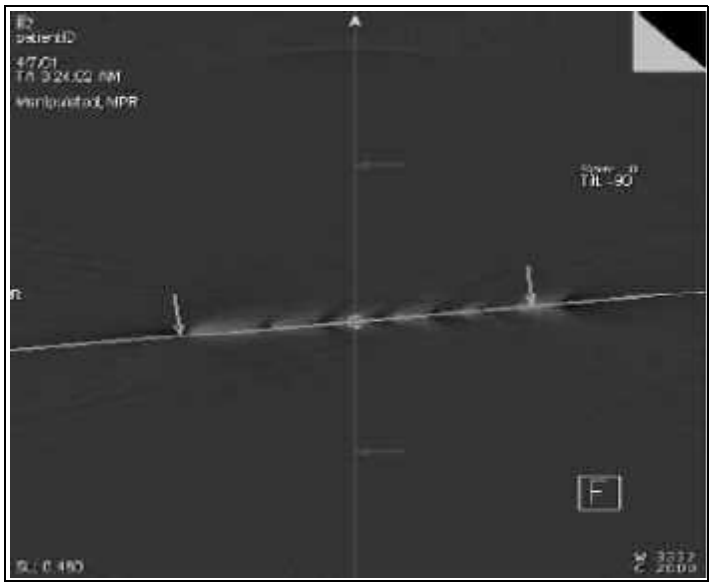


Fig. 25: Rotating the slice plane

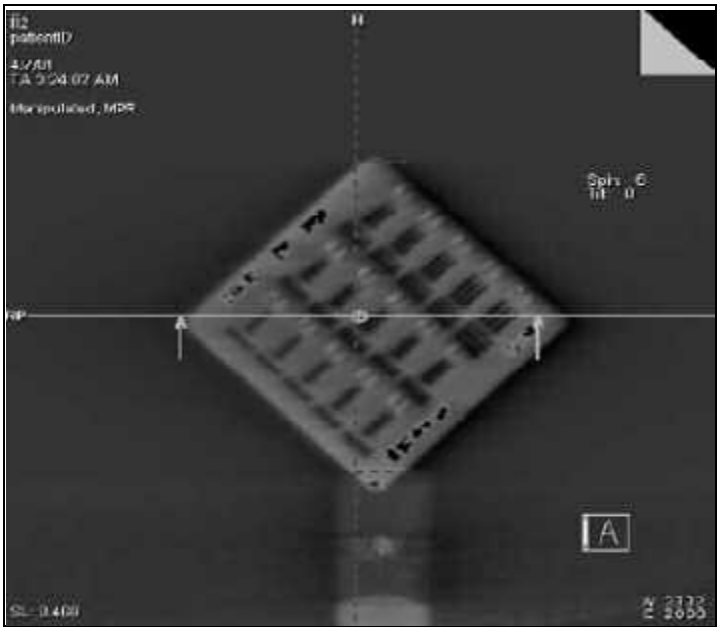


Fig. 26: Plane parallel to the lead strip test

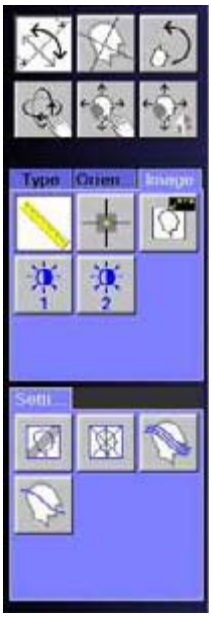


Fig. 27: Selection

- Subsequently generate a large image of the lead line grid by double-clicking on the "plane parallel to the lead strip test" image (see (Fig. 26 / p. 66)).

Evaluation

3D resolution

- Test the 3D resolution.

NOTE	It may be necessary to observe several planes.

Setpoint	≥ 1 LP/mm

	Factory	Place of use
Actual 3D resolution value:	----------	----------
3D resolution achieved:	❒ Yes ❒ No /	❒ Yes/ ❒ No

3D geometry

- Use the measuring function (see (Fig. 27 / p. 66)) in syngo to measure whether the edge length of the high-resolution slide are perpendicular to one another. The edge length should be 50 mm ± 1.5 mm, and the edges should be approximately equal.

Edge length 1: ..... Edge length 2: .....

	Factory	Place of use
Edge length difference ≤1.5 mm:	❒ Yes/ ❒ No	❒ Yes / ❒ No

Adjustment of the calibration phantom

NOTE

3D calibration has to be performed for every new installation to ensure optimum 3D image quality.

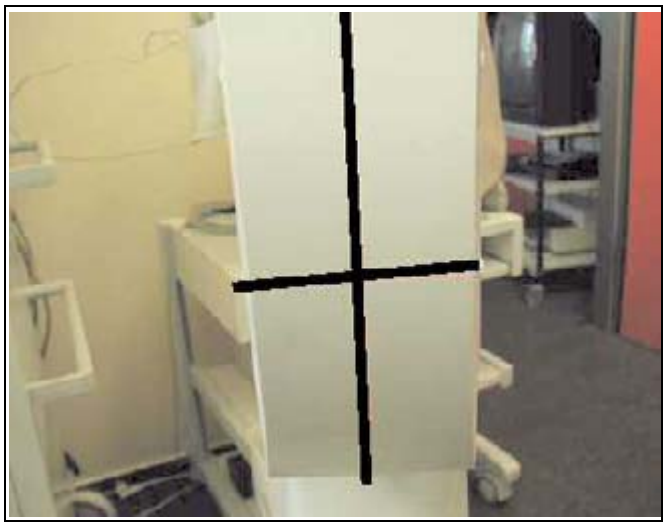


Fig. 28: Setting the I.I. light localizer correctly

Fig. 29: Calibration phantom

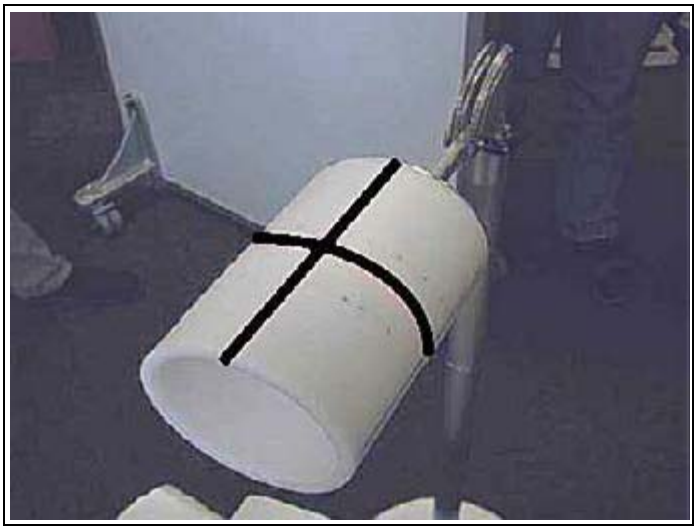


Fig. 30: Vertical adjustment

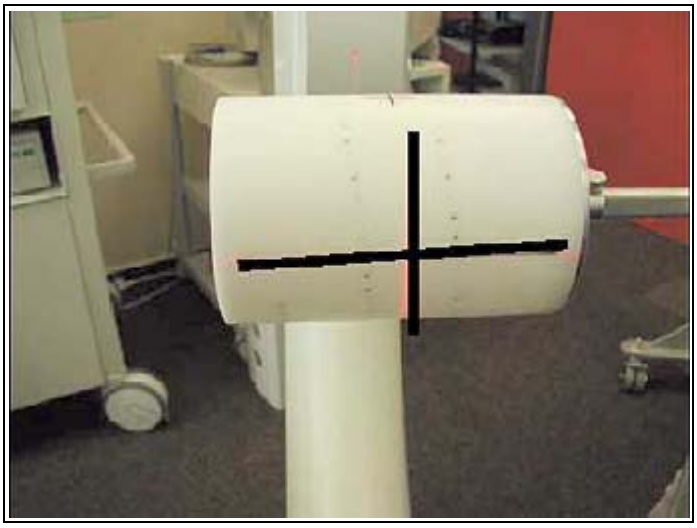


Fig. 31: Horizontal adjustment

- Take the required stand out of the "Calibration Phantom Service Case".
- Attach the calibration phantom to the stand.
- Affix 0.6 mm Cu at the radiation outlet to prevent regulating oscillations.
- Set the laser light localizer to the tube center ((Fig. 28 / p. 68)).

Systems equipped with a laser light localizer:

- Position the calibration phantom in the C-arm ((Fig. 29 / p. 68)).
- Using the light laser localizer, align the C-arm correctly with respect to the markings on the calibration phantom, first in the vertical ((Fig. 30 / p. 69)) and then in the horizontal ((Fig. 31 / p. 69)) C-arm position.

Without a laser light localizer:

- Align the C-arm correctly with respect to the markings on the calibration phantom, first in the vertical ((Fig. 30 / p. 69)) and then in the horizontal ((Fig. 31 / p. 69)) C-arm position.

Release fluoroscopy briefly and monitor the position of the C-arm with respect to the calibration phantom (also see (Fig. 32 / p. 70)).

- Check that the calibration phantom is positioned in the isocenter. To do so, check both the horizontal and vertical adjustment at least 2x (see (Fig. 32 / p. 70)).
  - ➪ Example of a correctly positioned calibration phantom. The tips of the sphere pattern must not be visible at the top and bottom image edge ((Fig. 32 / p. 70)).

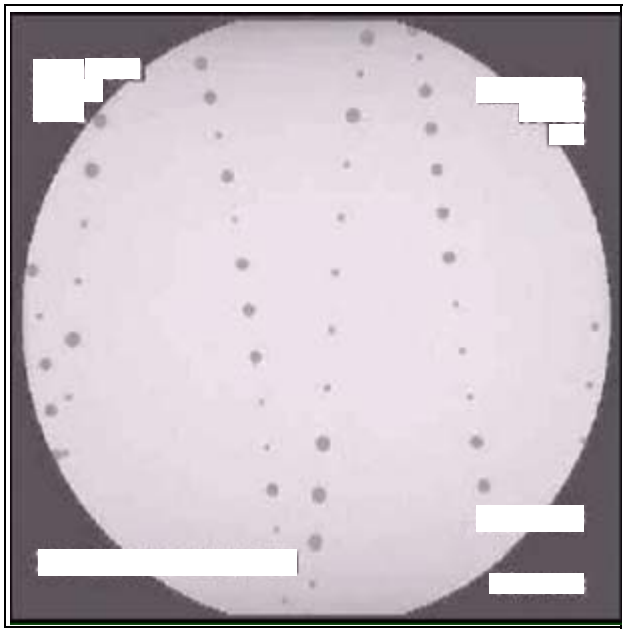


*Fig. 32: Positioning_*

Calibration without mounted navigation attachment

NOTE

3D calibration is to be performed according to the description in the “Description Window”.

NOTE

If 3D calibration is started, the message "success" is displayed after calibration of the first step even for calibration steps still to be performed.

However, calibration must be completed in accordance with the description in the description window.

Required material

3D calibration phantom	75 51 620 G5486

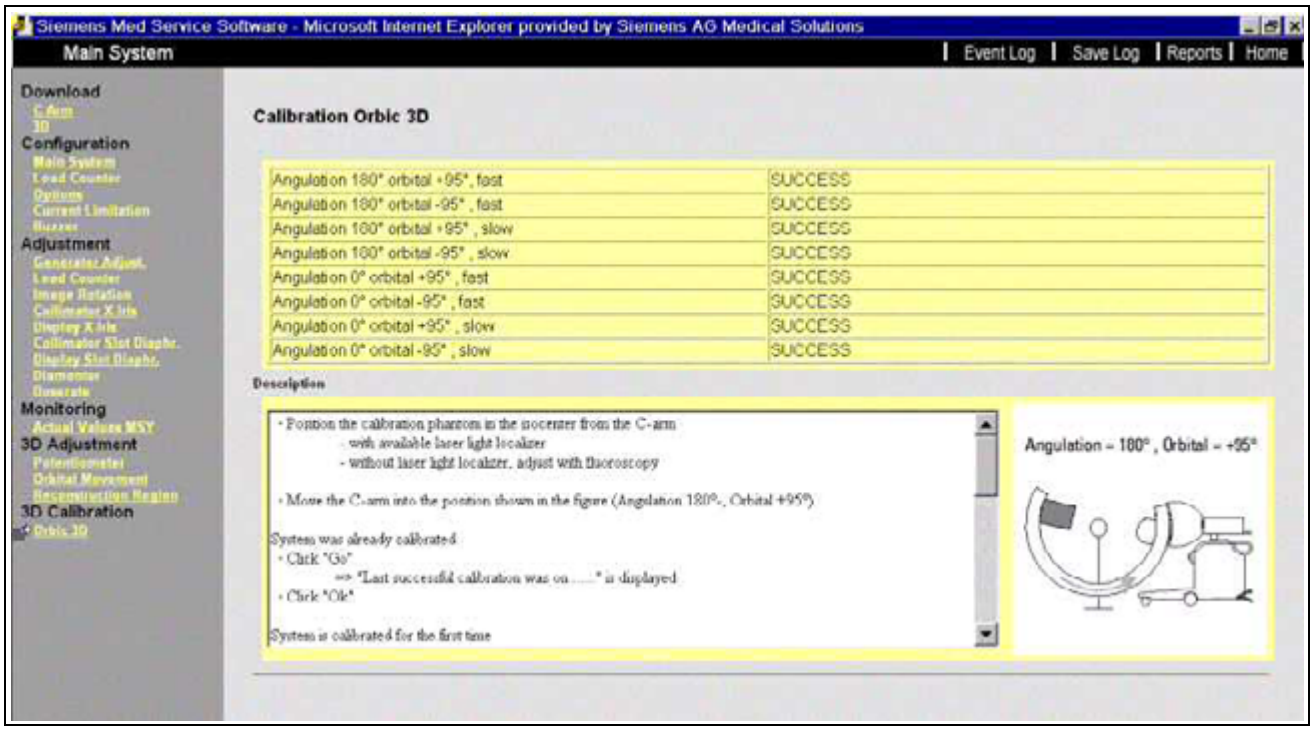


*Fig. 33: Calibration_*

	Factory		Place of use	
Calibration successful:	❒ Yes	❒ No	❒ Yes	❒ No

Calibration with mounted navigation attachment

Prerequisite:

The previously described 3D calibration without a navigation attachment must have been successfully performed (see above section: "Without 3D navigation").

NOTE

If more than one navigation system is used in combination with ARCADIS Orbic, the calibration is to be performed for every navigation system + each corresponding I.I. navigation attachment in cooperation with an engineer from the navigation company.

NOTE

The particular navigation attachment must be mounted on the I.I. via knurled screws/Allen wrench. The calibration must be performed together with the navigation system. Therefore, an engineer of the navigation company must also be present.

During calibration, the markers on the I.I. navigation attachment and the calibration phantom must be able to be recorded ("seen") by the cameras of the navigation system.

Ensure that the correct navigation system is selected in the calibration window.

- Select "3D calibration" (of the navigation system) in the service menu under "main system", and perform the 3D calibration with the mounted I.I. navigation attachment, see (Fig. 34 / p. 73).
- Calibration is to be performed according to the description in the description window, see (Fig. 33 / p. 71).

NOTE

If 3D calibration is started, the message "success" is displayed after calibration of the first step even for calibration steps still to be performed.

However, calibration must be completed in accordance with the description in the description window.

- Perform calibration completely.

Fig. 34: Navigation attachment

Checking the overall accuracy of the 3D navigation

NOTE

The overall accuracy after calibration must be checked together with the navigation system. Therefore, an engineer of the navigation company must also be present.

During the 3D exposure and the accuracy check, the markers on the I.I., test body and pointer must be detectable by the navigation system.

- Carefully attach the reference clamp to the test body (test body belongs to the customer).
- Position the test body in the isocenter of the ARCADIS Orbic 3D.
- Perform a 3D exposure and transfer the image data set to the navigation system.
- In three planes, move toward a marker cone with a pointer all the way into the tip of the marker cone as shown in (Fig. 35 / p. 74).

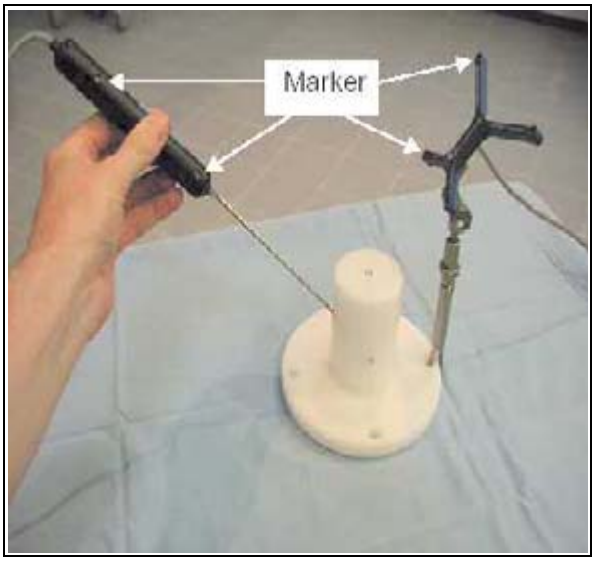


Fig. 35: Test_1

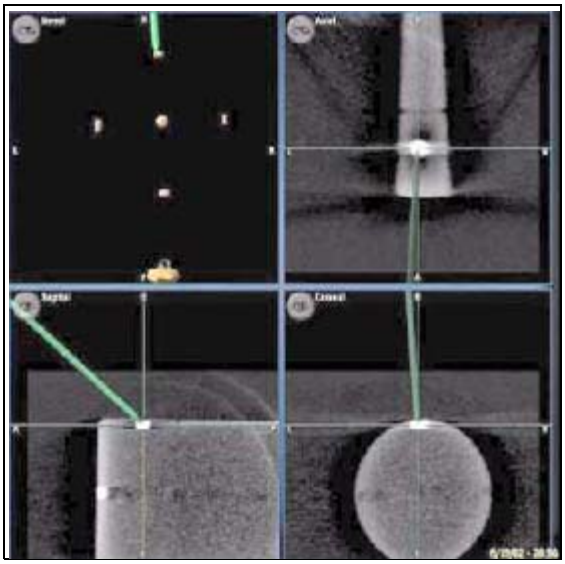


Fig. 36: Test_2

- The accuracy of the 3D navigation is proven if all three tips are within the marker cones shown on the navigation screen of the navigation company ((Fig. 36 / p. 75)).
- Complete the table, indicating the relevant navigation system.

Has the tip of the marker cone been reached	**by the pointer within the marker cone displayed on the navigation system?**		
	Navi-System	**Navi-System .....**	**Navi-System .....**
Plane 1 top			
Plane 2 center			
Plane 3 bottom			

The check of the overall accuracy of the 3D navigation has been successfully completed:

Name of Siemens engineer	Date	Signature
Name of navigation engineer.....	Date	Signature
Name of Siemens engineer	Date	Signature
Name of navigation engineer.....	Date	Signature

Remarks: _____

_____

_____

_____

Possible errors and corrective measures

Error	Possible cause	Corrective measure
Calibration unsuccessful	Dose unstable	Apply KV stop
Calibration unsuccessful	Phantom positioned incorrectly	Position phantom correctly
Image distorted	Lead balls missing in the calibration phantom	Order new calibration phantom
Poor image quality after calibration	Calibration process	Check 3D limiting resolution and recalibrate, if necessary
Insufficient accuracy of the 3D navigation	Interface at the calibration phantom not clean or damaged	Perform visual check of calibration phantom for correctness.
	Navigation marker ring on I.I. not mounted correctly	Make sure the marker ring is mounted correctly.
	The grid holder at the I.I. is dirty	Clean the I.I. and the grid holder
No registration possible during calibration with marker ring. Calibration does not start.	Markers are not detected in the starting position	Contact engineer of navigation company
Calibration with 3D navigation unsuccessful	Navigation system faulty	Contact engineer of navigation company
Other	Other	Read error messages in the Eventlog Reader Analyze and process errors according to troubleshooting instructions

Customer-specific organ programs (exam sets)

NOTE

Only at the place of use, only after changes to the organ programs (examination sets) as requested by the customer

No organ programs were changed during start-up. If "yes", do not perform the check of the newly programmed ADR control characteristics.	❒ Yes	❒ No	Date _____	Signature _____

Checking newly programmed ADR control characteristics

NOTE

The ADR control characteristics programmed by default were already checked in the "Checking the ADR control characteristics" section.

NOTE

The check of newly programmed ADR control characteristics facilitates testing of the ADR control characteristics during subsequent maintenance work.

During start-up, the determined values are entered in the "Setpoints" column of the "Changed organ programs" table.

During later checks, the determined values are entered in the "Actual values" column.

As a result, a comparison of the start-up values and the subsequently determined values is ensured.

Preparations

- Select fluoroscopy.
- Attach a 2.1mm Cu precision X-ray filter for prefiltration in the area of the radiation outlet.
- Select the organ program (exam set) with the changed ADR control characteristic.
- Enter the name of the organ program (exam set) with the changed ADR control characteristic in the "Organ program " column of the "Changed organ programs" table.
- Enter the name of the programmed ADR control characteristic in the "ADR control characteristic" column of the "Changed organ program" table. Use the name specified in the operating instructions.

Evaluation

- Leave the programmed dose rate level and enter it in the "Dose level" column of the "Changed organ programs" table.
- Radiation on.
- Read off the kV and mA values displayed on the control panel during start-up and enter them in the "Setpoints" column of the "Changed organ programs" table.
- Read off the kV and mA values displayed on the control panel during subsequent checks and enter them in the "Actual values" column of the "Changed organ programs" table.
- If additional organ programs with changed control characteristics are programmed, repeat the above-described procedure.
- Enter n.a. in all unused table rows.

Tab. 16 Changed organ programs

Organ program	**ADR control characteris-tics**	**Dose level**	**Setpoints (Start-up)**		**Actual values (Maintenance)**	
n.a.	n.a.	n.a.	kV	mA	kV	mA

Protective conductor test

- The image quality quick test can normally be performed without opening the covers. The protective conductor test is not necessary.
- However, if the ARCADIS Orbic covers were removed, the protective conductor test must be performed according to ARTD-002.731.17....

⚠WARNING

Danger of injuries, death or material damage.

Non-compliance can lead to death, injury or material damage.

Please note:

- ➪ **The product-specific safety information in the start-up instructions and system service documentation**
- ➪ **The general safety information in TD00-000.860.01... and**
- ➪ **The safety information in accordance with ARTD Part 2.**

All chapters:	Editorially revised,